

# SHIP SAFETY, EMERGENCIES, MAINTENANCE AND MANAGERIAL SKILLS



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## Chief Mate-FG (Phase-1)

Notes by: Anupam Singh Rajput  
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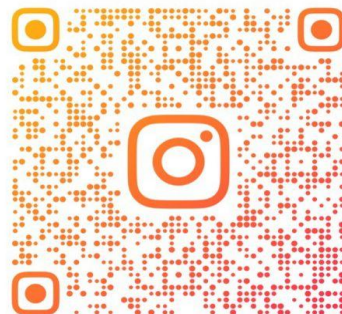
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## Q NO 1 (Page 17 to 43)

- Competence No. 17.1-17.5 (SOLAS-LSA)



## Q NO 2 (Page 44 to 70)

- Competence no. 17.6 (SHIP SAFETY AND SECURITY)



## Q NO 3 (Page 71 to 91)

- Competence no. 17.7 (SHIP MAINTENANCE AND REPAIRS)



## Q NO 4 (Page 92 to 110)

- Competence no. 18 (EMERGENCIES)



## Q NO 5 (Page 111 to 140)

- Competence no. 18 (SOLAS- FFA)



## Q NO 6 (Page 141 to 158)

- Competence no. 19 (LEADERSHIP AND MANAGERIAL SKILLS- Motivation, Team working skills, Resource management, Effective Communication)

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**Note:** "The number indicated alongside each question denotes the frequency of its appearance in past examinations up to January 2025."

GOVERNMENT OF INDIA

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)  
FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND  
CARE FOR PERSONS ON BOARD (Management Level)

PAPER: SHIP SAFETY, EMERGENCIES, MAINTENANCE AND MANAGERIAL SKILLS

TIME: 3 Hours

PASS MARKS: 75

MAX. MARKS: 150

**Notes:**

1. Attempt any 6 questions out of 7.
2. All questions carry equal marks i.e. 25 marks each.
3. Where applicable sketches should be drawn to support the answer.

Questions based on:

**Competency No.17: Maintain safety and security of the ship's crew and passengers and the operational condition of life-saving, fire-fighting and other safety systems**

- 17.1** A thorough knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea) - LSA Code
- 17.2** Organisation of fire and abandon ship drills
- 17.3** Maintenance of operational condition of life-saving, fire-fighting and other safety systems
- 17.4** Actions to be taken to protect and safeguard all persons on board in emergencies
- 17.5** Actions to limit damage and save the ship following a fire, explosion, collision or grounding
- 17.6 Safety and Security of the ship's crew and passengers:** Safety committee, maintenance of safety equipment, care and maintenance of rope wires, code of safe working practices, dock safety regulation. Reporting of accidents.
- 17.7 Ship maintenance and repairs:** Corrosion prevention, structure of paints and painting areas, Planned maintenance, maintenance of cargo handling equipment

**Competency No.18: Develop emergency and damage control plans and handle emergency situations**

**18.1 Emergency situations**

- 18.1.1** Demonstrates the knowledge of preparation of contingency plans for response to emergencies: Drawing plans to deal with emergencies, legal aspects and seamanship practices.
- 18.1.2** Understands ship construction with regards to damage control
- 18.1.3** Explains methods and aids for fire prevention, detection and extinction: Fire prevention procedures, different types of fires and firefighting equipment to be used, fighting fire on different types of ship.
- 18.1.4** Understands functions and use of life saving appliances: Different types of emergencies, actions taken, life saving appliances and instructions to use it.

**Competence No. 19: Use of leadership and managerial skills**

- 19.1** Knowledge of shipboard personnel management and training

19.2 A knowledge of related international maritime conventions and recommendations, and national legislation

19.3 Ability to apply task and workload management, including

19.3.1 planning and co-ordination

19.3.2 personnel assignment

19.3.4 time and resource constraints

19.3.5 prioritization

19.4 Knowledge and ability to apply effective resource management

19.4.1 allocation, assignment, and prioritization of resources,

19.4.2 effective communication on board and ashore,

19.4.3 decisions reflect consideration of team experiences,

19.4.4 assertiveness and leadership, including motivation,

19.4.5 obtaining and maintaining situation awareness

19.5 Knowledge and ability to apply decision-making techniques

19.5.1 situation and risk assessment,

19.5.2 identify and generate options,

19.5.3 selecting course of action,

19.5.4 evaluation of outcome effectiveness

19.6 Development, implementation, and oversight of standard operating procedures

Q. 1. Competence no. 17.1- 17.5 (SOLAS- LSA)

Q. 2. Competence no. 17.6 (SHIP SAFETY AND SECURITY)

Q. 3. Competence no. 17.7 (SHIP MAINTENANCE AND REPAIRS)

Q. 4. Competence no. 18 (EMERGENCIES)

Q. 5. Competence no. 18 (SOLAS- FFA)

Q. 6. Competence no. 19 (LEADERSHIP AND MANAGERIAL SKILLS- Motivation, Team working skills, Resource management, Effective Communication)

Q. 7. Competence no. 19 (LEADERSHIP AND MANAGERIAL SKILLS- Risk Assessment, Training of personnel, Standard Operating Procedures)

## Q. 1. Competence no. 17.1- 17.5 (SOLAS- LSA)

- 1) Describe the operational readiness, maintenance & inspection requirement of L.S.A. as per SOLAS Chapter III? (12 times)  
(AND),

How will you ensure operational readiness of the Survival Crafts on board your ship as per the Regulation 20 of Chapter III of SOLAS?

- 2) Explain LSA Code. (3 times)

(OR),

Briefly describe the purpose & objectives of LSA code. (5 times)

### 17.1,17.3) SOLAS/LSA CODE Requirement

- 3) Briefly describe the LSA Code requirements relating to personnel lifesaving appliances such as **life jackets, lifebuoys, immersion suits and anti-exposure suits**. (5 times)

- 4.a) List the requirements for **lifeboat** as per LSA Code. (3 times)

d) Briefly describe the LSA code requirements related to on-load release & retrieval system (OLRRS) of lifeboats. (2 times)

- 5) List requirements for **rescue boats** as per LSA code?

- 6.a) With reference to LSA code, enumerate the requirements for construction, *stability* and markings of inflatable life-rafts? (4 times)  
(OR),

Briefly describe the LSA code requirements related to construction, markings, *packing and stowage* of inflatable life raft including its weak – link arrangement, if fitted.

(OR),

What are the LSA code requirements with regards to **Life rafts**?

- 4.b & 6.b) What are the LSA code requirements regarding marking of Lifeboat and inflatable Life Rafts? (3 times)

- 4.c & 6.c) Briefly write about the weekly and monthly inspection routine for above? (2 times)

- 7) Briefly describe the LSA Code requirements relating to life saving appliances, namely, **marine evacuation systems, Line Throwing Apparatus, Embarkation Ladders and Buoyant Smoke Signals**.

- 8.a) Prepare a list of Life Saving Appliances required as per SOLAS Chapter III for a chemical tanker built 2010 engaged in International Voyages. (2 times)

- 8.b) For bulk carrier built in 2012, engaged on international voyages, prepare a list of LSA as per SOLAS Chapter III. (2 times)

- 9) As per chapter III of SOLAS, describe the requirements of 'Training Manual' and 'Instructions for on board maintenance' of life saving appliances. (2 times)

### 17.2) Muster List/Drill

- 10) Prepare an emergency **muster list** for a ship which has a total complement of 20 persons taking into account all the requirements of muster list and emergency instructions specified in Chapter III of SOLAS. (5 times)

(OR),

Prepare an Emergency Muster List for a ship with a total complement of 21 (4 Deck Officers, (including Master), 4 Engineer Officers, Electrician, 5 Deck ratings, 3 Engine Ratings, 2 Catering Ratings, 1 Deck and a Engine cadet). Ensure all the information as required by SOLAS is shown. (4 times)

(OR),

Prepare an Emergency Muster List for ship with a total complement of 25 persons.

- 11) How will you organize and conduct the **fire drill and abandon ship drill** as per SOLAS. (4 times)

(OR),

As per SOLAS how will you ensure to conduct a abandon ship & fire drills in a realistic manner? (4 times)

Q) What is the methodology, you as a chief officer, will adopt to make a various drill more realistic?

Answer same as Ques no 11

12) Prepare an Annual Drill Planner for conducting all the drills as per SOLAS, MARPOL and ISPS codes. (7 times)

13.a) How abandon ship drill organized in a ship where free fall lifeboat in the provisions?

b) Give a detailed debriefing of the drill conducted with suggestions if any for improvement?

## **Q. 2. Competence no. 17.6 (SHIP SAFETY AND SECURITY)**

**17.6 Safety and Security of the ship's crew and passengers:** Safety committee, maintenance of safety equipment, care and maintenance of rope wires, code of safe working practices, dock safety regulation. Reporting of accidents.

### **ISPS CODE**

1) What are the salient features of the ISPS Code to ensure the security of the ship's crew and passengers? (6 times)

2) With respect to "ISPS code" explains the following:

a) Ship Security assessment (7 times)

b) Ship Security Plan. (7 times)      bb) Procedure for amendment of Ship Security Plan. (2 times)

(OR),

As per the ISPS Code, what are the contents of the Ship Security Plan? (3 times)

(OR),

How is a ship security plan made and what are its contents and draw procedure for its revision.

c) Security Levels and Duties and responsibilities of every individual at various security levels. (11 times)

3.a) Enumerate the duties & responsibilities of Ship Security Officer (SSO). (8 times)

(OR),

As a ship security officer, how will you ensure the security of the vessel? (2 times)

3.b) What are the roles and responsibilities of the CSO?

4) With respect to ISPS Code, what are the obligations of the ships, terminals and the shipping companies? (2 times)

### **ISM CODE**

5.a) Describe the functional requirements of ISM code. (2 times)

5.b) Describe the objectives of ISM Code.

5.c) List the various elements of the ISM Code.

6.a) State the criteria for appointing a safety officer and explain in detail his responsibilities in ensuring safety on board. (6 times)

6.b) As a safety officer, list the various responsibilities and duties you are required to fulfill. Enumerate some proactive measures you will take to enhance safety awareness and compliant onboard. (4 times)

7) Draw up a checklist for conducting routine safety inspection on board related to personnel health & safety by safety officer. (6 times)

### **SAFETY COMMITTEE**

- 8) Explain the role of Safety Committee on-board the ship. (2 times)
- 9) In Monthly Safety Committee meeting, describe the various agenda items to be discussed. (3 times)

### **CODE OF SAFE WORKING PRACTICES**

- 10) Explain the purpose and objectives of "Code of Safe Working Practices".
- 11) List the items covered during the Chief Officer's weekly safety inspection of ship as prescribed in code of Safe Working Practices. (3 times)
- 12) As per the code of safe working practices for merchant seaman, explain the care and maintenance required for ropes and wires? (2 times)
- 13) a) What is the purpose of the "work permit"? What are the contents of work permit?  
b) As per COSWP, what precautions will you take while working aloft?  
c) Prepare a check list for enclosed space entry and explain importance of same?

### **DOCK SAFETY REGULATION**

- 14) With respect to DOCK LABOUR REGULATIONS, write a short note on:  
i) Responsible Person & Competent Person ii) Test & Periodical examination of lifting appliances. (3 times)
- 15) As per dock worker regulations. What are powers of dock inspector?

### **REPORTING OF ACCIDENTS**

- 16) Describe the procedure available onboard ship for reporting of accidents (2 times)
- 17) During cargo operations, one of the stevedore's men gets injured while working on board, how will you deal with this situation?
- 18) a) Prepare a contingency plan for piracy?  
b) Describe the Best Management Practices (BMP) to be followed to deter Piracy.  
c) What are the reporting requirements for transiting piracy areas?  
d) List the actions required in sequence during ship search drills?

### **Q. 3 Competence no. 17.7 (SHIP MAINTENANCE AND REPAIRS)**

**17.7 Ship maintenance and repairs:** Corrosion prevention, structure of paints and painting areas, Planned maintenance, maintenance of cargo handling equipment

#### **CORROSION PREVENTION**

- 1) How corrosion prevention is important to ensure safety of life and marine environment? (5 times)
- 2) What are the parts of ship's hull most liable for corrosion and how you counteract this from getting corroded. (4 times)
- 3) Fore peak water ballast tank is showing signs of corrosions. How would you treat it? (3 times)

#### **STRUCTURE OF PAINTS AND PAINTING AREAS**

- 4) Prepare a painting scheme for cargo and other pipelines on main deck. (4 times)
- 5) What precautions would you take before and while painting steel deck plates? (3 times)

#### **PLANNED MAINTENANCE**

- 6.a) What is the planned maintenance system? What are the advantages and disadvantages of computer-based PMS over conventional maintenance Scheme? (6 times)
  - b) Is it mandatory to have PMS and under which regulation / convention? Can your ship be detained by PSC inspector in absence of a PMS on board? (3 times)
- 7.a) How planned maintenance system helps in achieving the safety of the crew onboard the ship? (5 times)
  - b) How does Planned Maintenance System (PMS) serve to reduce cost and increase reliability of hull, machinery and equipment? (2 times)
- 8) Write short notes on: i) Preventive Maintenance ii) Incidental Maintenance (5 times)
- 9.a) As a chief officer, prepare a plan to implement PMS on board a newly built yard deliver vessel. (3 times)

(OR),

As a Chief Officer explain how would you assist in preparing and implementing a planned Maintenance System for a new building ship, which is in her final stage of delivery? (2 times)
- Q) State the advantages of a Planned Maintenance System. Assuming you are taking over a second-hand ship, explain how will you assist your superintendent in creating a computerized PMS in the absence of any past data from previous owners/ operators?

*Ans: Same as 9.a*

- 9.b) List out the documents and data you will use in preparing PMS of a ship.
- 10) What are the factors, which need to be considered while deciding upon the interval between two inspections or schedule of maintenance of an item in the Planned Maintenance System?
- 11.a) Prepare a maintenance schedule of hydraulic hatch covers. (5 times)
- 11.b) Prepare a Planned maintenance schedule for cargo handling crane. (3 times)
- 11.c) Prepare PMS scheduled for mooring winches on your ship?
- 11.d) Draw out a planned maintenance and inspection schedule for lifeboats, davits and Winches

(OR),

Prepare a planned maintenance routine for the totally enclosed lifeboat and the associated gravity davit, covering weekly, monthly, quarterly, annual and 5 yearly maintenance, inspections and tests.

(OR),

Prepare a PMS for your rescue boat

11.e) Draw out a Planned Maintenance schedule for Accommodation ladders and pilot hoists

### **MAINTENANCE OF CARGO HANDLING EQUIPMENT**

12) List out the maintenance requirements for lifting appliances over a period of 5 years. (5 times)

13.a) Describe the maintenance work to be carried out in a dry dock for anchor and cables, sea chests, storm valves and under water portion of the ship's hull. (5 times)

13.b) Prepare the list of essential maintenance items to be covered under the Dry Dock defect list. (3 times)

Q) How will you carry out maintenance of cargo handling equipment for a tanker ship?

Ans: Same as 11.b

Q) As a Chief Officer prepare a check list for:

i) Maintenance of Hatch Covers: *Same as 11.a*

ii) Maintenance of Mooring Equipment: *Same as 11.c`*

iii) Maintenance of Accommodation Ladder: *Same as 11.e*

### **Q. 4 Competence no. 18 (EMERGENCIES)**

1) Who is a Port State Control Officer (PSCO)? State the purpose of a Port State Control Inspection? How are ships selected for inspection by PSC? What are clear grounds for detailed inspection during PSC inspection? (4 times)

2) "Emergency preparedness" is required as per ISM code. How will this will be achieved onboard? (3 times)

3) Briefly describe the guidelines for development of harmonized contingency plans for ship board emergencies as given in IMO res.A.852 (20). (3 times)

4) a) A coaster has collided with you anchored ship, a loaded crude oil tanker, on which you serving as Chief Officer. Cargo is **escaping** from above the waterline. List the initial and subsequent actions that you will take. (4 times)

b) Describe the requirements of SOLAS Chapter II-I relating to protective coating of dedicated sea water ballast tanks and double side skin space? (4 times)

5) a) Describe the immediate actions to be taken to minimise the damage to the ship following a **fire or explosion** (4 times)

b) Prepare a contingency plan to deal with **leakages and spills** of dangerous cargoes inside a cargo hold. (8 times)

6) Prepare the list of immediate action plan in the event of:

a) Fire in pump room (6 times)

b) Fire in the engine room (3 times)

c) Fire in accommodation area. (3 times): *Same as 5.a*

d) Cargo oil spillage (2 times): *Same as 4.a*

7) As a chief officer on a large container vessel, you sustain damage in way of a fuel oil tank while berthing alongside. Some quantity of fuel oil has polluted in port. List your actions to minimize the **pollution** damage and to protect your interest. Give a list of parties to be informed, the documentation necessary under MARPOL Convention and all other necessary actions for this contingency. (5 times)

8) As a Chief Officer, prepare a contingency plan:

a) Rescue of survivors from another ship at sea (7 times)

b) Rescuing an unconscious person from pump room bottom platform. (3 times)

**Q)** As Chief Officer on duty on Bridge while at sea in coastal area, observed heavy thick smoke in the sky at a distance of about 5 miles from your vessel. While checking with Binocular you also see some flames and it seems that a small craft like fishing boat is in heavy fire. Describe your immediate action and Contingency plan for **rescue of survivors** from boat or sea? (2 times)

Ans: Same as 8.a

**9)** Prepare the list of immediate action plan in the event of:

**a)** Man Overboard (2 times)

(OR),

You are at sea on your voyage & observe from Bridge that a seaman who was painting combination ladder has fallen overboard. List out all actions in chronological order you will follow in this emergency situation?

**b)** Grounding (3 times)

**c)** Collision

(OR),

Prepare a detailed emergency checklist for action to be taken in case of "collision" with the pilotage waters. (2 times)

**10)** What are the contingency plans in respect to: (2 times)

(a) Grounding of a passenger ship on reef, and

(b) Ice Navigation off Grand Banks of Newfoundland.

**11)** Describe the procedure for rigging and effective use to tackle refloat a grounded vessel. (3 times)

**12)** Describe the modern tools and equipment available for damage control which can be used on board in case of flooding or other structural damages. (2 times)

### **Q. 5 Competence no. 18 (SOLAS- FFA)**

#### **Regulation 10: Fire fighting**

##### **FIXED CO2 SYSTEM**

**1)** What are the **regulations** for fixed gas extinguishing systems as per SOLAS? (2 times)

**2)** Explain the **functioning and purpose** of CO2 fixed firefighting system found onboard tanker ships. (3 times)

**3)** Draw a sketch to show **working** of CO2 system in use on ships and describe it working. (10 times)

(OR),

With the help of a suitable sketch enumerate the **working principle, operating procedure** of CO2 fixed Fire Fighting system (3 times)

**4.a)** Briefly state the **maintenance and testing** (including pressure testing) requirements of a CO2 fixed gas fire extinguishing system for Engine room /Cargo holds (4 times)

**4.b)** What safety precautions will you take prior to inspection and maintenance of this system? (2 times)

**5)** Explain why CO2 is used for fire extinguishing. (3 times)

**6)** How would you re-enter the engine room after the fire has been extinguished by means of CO2?

## **FIXED FOAM SYSTEM**

- 7) Explain with a labelled diagram, the working of Fixed Foam System in Machinery Spaces and what are its advantages over CO<sub>2</sub> system. (2 times)
- 8.a) With a neatly labelled sketch explain the fixed deck foam firefighting system fitted for cargo deck protection of a chemical tanker.
- 8.b) Describe the maintenance required for the above system to ensure continuous availability.

## **FIXED PRESSURE WATER SPRAYING SYSTEM**

- 9) With the help of a diagram, briefly explain the working principle, maintenance requirements, and operating procedures of sprinkler and water spraying systems on board passenger ships. (5 times)
- 10) Describe the onboard test procedure and interval for automatic sprinkler system and hyper mist water spray system. (2 times)

## **Regulation 2: Fire safety objectives and functional requirements**

- 11) Describe fire Safety Objectives? In order to achieve the fire safety objective what functional requirements are embodied in the regulations of SOLAS chapter II?

## **Regulation 7: Detection and alarms**

- 12) Explain the procedure to try out all fire alarms as per routine checks.
- 13) Explain the methods and aids available for fire detection on-board RO-RO/passenger vessels
- 14) Explain about the various types of fire detector found on oil tanker
- 15) With the help of a suitable sketch enumerate the operating principle and maintenance requirements of smoke detection system fitted for cargo holds. (2 times)

## **Regulation 9: Containment of Fire**

- 16) What is a Standard Fire Test? Describe the Class Divisions for Structural Fire Protection on ships. (2 times)
- 17) Define – (i) “A” Class division (ii) “B” Class divisions (iii) “C” Class divisions (iv) Bulkhead Deck.

## **Regulation 10: Fire fighting**

- 18) Describe the maintenance and inspection procedures for portable fire extinguishers, fire dampers, fire hydrants and fire hoses & nozzles. (4 times)
- 19) Describe the complete maintenance procedure i.e. weekly, monthly, quarterly, yearly and five yearly routines for EEBD, SCBA sets and the associated fireman’s outfit? (2 times)
- 20) Describe the fixed and portable fire-extinguishing arrangements provided in machinery spaces of Oil Tankers? (Reg 10.5) (3 times)

## **Regulation 14: Operational readiness and maintenance**

- 21) Briefly describe the SOLAS requirements relating to ‘Operational readiness and maintenance’ of life saving and fire-fighting appliances on board ships as detailed in chapter II and III of SOLAS? (5 times)

## **Regulation 15: Instructions, onboard training and drills**

- 22) What should be the contents and use of the ship’s FFA training manual? Who is to provide this manual, in how many copies and where should this manual be kept on board?

## **Regulation 2: Fire safety objectives and functional requirements**

**23)** When designing a ship, what are the basic principles to be followed to control the damage caused by fire? (5 times)

## **Regulation 19: Carriage of dangerous goods**

**24)** List out the additional firefighting equipment required for carriage of dangerous cargoes. (4 times)

## **OTHERS**

**25)** With respect to an oil tanker how each of the following are achieved: (2 times)

- a) Prevention of Fire & Explosion in cargo tanks.
- b) Prevention of Fire & Explosion in Accommodation and Machinery spaces.
- c) Prevention of Fire & Explosion in the cargo pump room.

## **Q. 6 Competence no. 19 (LEADERSHIP AND MANAGERIAL SKILLS- Motivation, Team working skills, Resource management, Effective Communication)**

### **MOTIVATION**

**1)** Motivation is key factor for performance enhancement. As a Mate, how will you motivate your subordinates in order to achieve optimum performance level? (6 times)

(OR),

How will you motivate your crew in order to extract the maximum output from them? (4 times)

(OR),

Explain with reference to Maslow's hierarchy theory, how you will motivate your subordinates to give maximum productivity in their daily during their full tenure? (2 times)

(OR),

Explain Maslow's theory of hierarchy and how you can use it to motivate your crew whose sign off has been delayed due to COVID-19 pandemic.

(OR),

What are the different techniques that can be adopted to motivate the crew members on board the ship to obtain optimum results?

**2)** Does motivation come from within a person or is it a result of situation? Explain with the help of relevant theory and shipboard examples? (6 times)

**3)** As a chief officer you have to balance company and operational requirements with the personal demand of junior officer and crew on board. In which way can you encourage and motivate your subordinates onboard? (3 times)

**4)** What you understand by Motivation and discuss regarding sources of motivation.

**5)** How will you motivate your junior officers as part of bridge team management?

**6)** What is personal power and positional power? Explain how will you as a chief officer, motivate your crew keeping a balance between the two?

### **TEAM WORKING SKILLS**

**7)** How as a Chief Officer on a Chemical tanker with hectic work schedule, will you prevent fatigue to the crew members? (6 times)

**8)** What are the various signs, causes & effects of fatigue? (8 times)

**9)** What are the factors will you as a chief officer, consider while delegating various tasks to your subordinates? (3 times)

- 10)** What are the essential elements you will allocate while setting the priorities? (3 times)
- 11)** Explain Team work, Team building and interpersonal relationship with suitable examples in achieving its goals.
- 12) a)** Define: i) Authority ii) Assertiveness iii) Delegation
- b) "Team work helps in better productivity", as a chief mate discuss this statement in context of operations onboard your ship.

### **RESOURCE MANAGEMENT**

- 13)** Explain the basic principles of effective resource management. (2 times)
- 14)** Discuss management of resources and personal with regards to prioritization, fatigue control, communication and leadership.

### **EFFECTIVE COMMUNICATION**

- 15)** List out some barriers to effective communication on board. Explain with onboard situation. (5 times)
- 16)** Explain with the help of block diagram method of effective communication on a ship. (2 times)
- 17.a)** Explain different types of communication.
- 17.b)** Explain why effective communication is a vital clog for smooth running of ships?
- 18)** As a Chief Officer on board how will you motivate your team members using effective communication skills to get work done on board? Illustrate with on board situations.

### **LEADERSHIP AND MANAGERIAL SKILLS**

- 19)** "Personal Power & Situational Awareness helps in maintaining cordial environment on board for routine jobs". Justify the statement with onboard situation. (4 times)
- 20)** "Using different Situational Leadership Styles contributes to effective bridge team work". Justify this statement with on board situations. (2 times)
- 21)** List out the essential Leadership and Managerial Skills required for a Chief Officer onboard the ship. (3 times)
- 22)** As a Ch/off explain the areas you would concentrate to be an effective Leader & increase the efficiency of crew. Explain with the help of onboard situation (5 times)
- Q)** As a chief officer how and when will you use "Situational Leadership" to get effective work done from your team members?  
[Similar answer from Q. 20](#)
- Q)** "Chief officer needs to have good leadership and managerial skills". Justify this statement with onboard situation.  
[Similar answer from Q. 21](#)
- 23)** What are the most important values one must demonstrate as a Leader? How can a leader fail? Give an example of a situation when you failed as a Leader. (2 times)
- 24)** Explain in detail situational theory of Leadership in detail with onboard example.
- 25)** Explain human error & how can it be minimized? (2 times)

**Q. 7 Competence no. 19 (LEADERSHIP AND MANAGERIAL SKILLS- Risk Assessment, Training of personnel, Standard Operating Procedures)**

**RISK ASSESSMENT**

- 1) What is Risk Assessment? (7 times)
- 2) What are the essential elements of a risk assessment and the relevance of every element? (5 times)
- 3) Enumerate the methods to carry out risk assessment? (3 times)
- 4) Explain Risk Assessment for entry into Double bottom Ballast tanks for purpose of inspection. (6 times)  
(OR/AND),  
Carry out a risk assessment for carrying out inspection of a cargo tank in an oil tanker
- 5) Prepare a risk assessment, as a chief officer, you will make to carry out a hot work inside the cargo tank of an oil/chemical tanker. (5 times)
- 6) Prepare a risk assessment for the task of over hauling of remotely operated hydraulic valve of cargo pipeline inside the tank, keeping in mind all the mandatory requirements. (3 times)
- 7) Make a risk assessment for renewal of runner wire of a Life boat/deck cranes (2 times)
- 8) Prepare a risk assessment for rigging of combination ladder while enroute to the pilot station from sea.
- 9.a) Prepare a Risk Assessment sheet for navigating in restricted visibility. (2 times)
- 9.b) Make a risk assessment for navigating in narrow channel.
- 9.c) Carry out risk assessment for approaching a pilot boarding ground to pick up pilot on-board a VLCC in congested waters such as Singapore Strait.
- 10) Carry out a risk assessment for a Ship-to-Ship Transfer on an oil tanker (2 times)

**TRAINING OF PERSONNEL**

- 11) What are the guidelines given in the STCW code regarding on board training for cadets? (3 times)  
(OR),  
Describe structured ship board training program as per STCW 2010. (2 times)  
(OR),  
State the training methods you would use as a Mate to train deck cadets under Structured Ship board Training Programme (SSTP)
- 12) As a chief officer of a container ship how will you prepare a training schedule for a new junior deck officer? (3 times)
- 13) Why do you train personnel on board? Explain the process you would follow to initiate the training of a new deck officer joining an oil tanker in port before taking over his duties and why is it important to follow this process. (3 times)
- 14) With reference to SOLAS, list the on-board training and instruction you should give to each crew member with model training schedule. (4 times)
- 15) As a chief officer, how will you improve safety awareness of crew and officers on board? What various methods will you use? (2 times)
- 16) As a Chief Officer of an oil tanker how would you train your crew towards safe working on deck (considering fatigue condition)?
- 17) Develop a Training plan for all ship staff upon takeover of a new ship at the yard, and to be implemented before the vessel sails for her first voyage. (2 times)
- 18) Describe in detail, how effective training to the crew can be imparted with respect to LSA and FFA equipment?

**19)** With reference to SOLAS, list the basic familiarization training you would give to a Newly joined cadet. (2 times)

### **Standard Operating Procedures**

**20.a)** Explain Standard Operating Procedure (SOP)

(OR),

What are SOP's (Standard Operation Procedures) and why are they needed? (2 times)

**20.b)** Explain how to develop & methods to implement the standard operating procedure (SOP).

**21.a)** Prepare a Standard Operating Procedure (SOP) for a critical ship board operation such as "Entry in to a Cargo Oil tank for inspection" during ballast passage of an Oil Tanker. (5 times)

**21.b)** Prepare a SOP for "Refilling of SCBA bottles using a shipboard SCBA compressor". (2 times)

**21.c)** Make standard operating procedure (SOP) for renewal of runner wire of a Life Boat. (2 times)

**21.d)** Prepare a Standard Operating Procedures (SOP) for testing the integrity of cargo sea chest valve in pump room?

**21.e)** Prepare a Standard Operating Procedure (SOP) for a critical ship board operation such as "connection/ disconnection of spool piece between the sea chest and cargo line" in the pumproom of a product tanker.

### **Others**

**22.a)** Briefly explain the content and application of the STCW convention.

**22.b)** Explain elements of STCW 2010 and discuss the new amendments & its effect.

**23)** Describe the hours of work and rest hours for watch keepers as per STCW and MLC.

**24)** Explain the term "Overriding operational conditions" in relation to rest hours requirements as per STCW 2010.

**25)** How will you ensure the rest hour requirements for watch keepers and other crew members being compiled with as per STCW 2010 and MLC 2006? (3 times)

(OR),

How will you ensure that requirements regarding hours of work and rest periods as per ILO / MLC 2006 / STCW 2010 are being implemented effectively? (3 times)

## Q. 1. Competence no. 17.1- 17.5 (SOLAS- LSA)

(Page No 17 to 43)

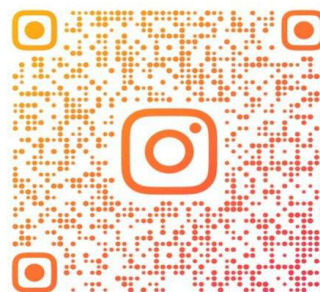


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**Q.1. Competence NO. 17.1 - 17.5 (SOLAS-LSA)**

Ques 1) Describe the operational readiness, maintenance & inspection requirement of L.S.A as per SOLAS Chapter III? (12 times)  
 (AND),

How will you ensure operational readiness of the survival crafts on-board your ship as per the Regulation 20 of Chapter III of SOLAS?

Ans:- Regulation 20

Operational readiness, maintenance and inspections

1. This regulations applies to all ship.

2. Operational readiness

Before the ship leaves port and at all times during voyage, all life-saving appliances shall be in working order and ready for immediate use.

3. Maintenance

3.1 Maintenance, testing and inspections of life-saving appliances shall be carried out based on the guidelines developed by the organization and having due regard to ensuring reliability of such appliances.

3.2 Instructions for on-board maintenance of life saving appliances shall be provided and maintenance shall be carried out accordingly.

3.3 The administration may accept, a shipboard planned maintenance programme, if it complies with paragraph 3.2 and includes the requirements of Reg. 36.

4. Maintenance of falls

Falls used in launching shall be inspected periodically (especially the areas passing through sheaves) and renew if it shows sign of wear or damage, or, at interval of not more than 5 years, whichever is the earlier.

6. Weekly inspection

The following tests and inspection shall be carried out weekly and a report of the inspection shall be entered in the log book:

6.1 Visual inspection of all survival crafts, rescue boats and launching appliances. The inspection shall include, but not limited to, the condition of hooks, attachment to the lifeboats and on-load release gear.

6.2 All engines in lifeboats and rescue boats shall be run for a total period of not less than 3 min.

6.3 Lifeboats, except free fall lifeboat, on cargo ship shall be moved from their stowed position, without any person on-board

6.4 The general emergency alarm shall be tested.

### 7. Monthly inspection

7.1 Lifeboats, except free fall lifeboat, shall be turned out from their stowed position, without any person on-board, if weather and sea conditions allow.

7.2 Inspection of lifeboat equipment shall be carried out monthly using the checklist in Reg 36.1 to ensure they are complete and in good order.

8. Servicing of inflatable liferafts, inflatable lifejackets, marine evacuation systems.

Every inflatable liferafts, inflatable lifejackets and marine evacuation system shall be serviced at intervals not exceeding 12 months. Where this is impracticable, the administration may extend this period to 17 months.

Ques 2) Explain LSA code. (3 times)  
 (OR),

Briefly describe the purpose & objective of LSA code (5 times)

- Ans:-
- International life saving appliances (LSA) code was adopted by IMO's Maritime Safety Committee (MSC) in JUNE 1996 by Res. MSC.48(66).
  - It provides international requirements for the life saving appliances required by Chapter III of the 1974 SOLAS convention
  - The code entered into force on 1 July 1998.
  - In simple words, LSA code tells how life saving equipment should be designed, constructed, tested and maintained.
  - The code specifies detailed requirement for
    - Lifebuoys
    - Lifejackets
    - Immersion suits
    - Anti exposure suits
    - Thermal protective aid
    - Visual aid such as parachute flares, hand flares & buoyant smoke signal
    - Survival craft such as liferaft, lifeboat & rescue boat.

- launching and embarkation appliances
- Marine evacuation system
- Line throwing appliances.
- General emergency alarm
- Public address system.

### Purpose of LSA code

The purpose of this code is to provide international standards for life-saving appliances required by chapter III of the International convention for the safety of life at sea (SOLAS), 1974.

### Objective of LSA code

- To ensure safety of life at sea during emergencies
- To standardize design, construction, performance and testing of lifesaving appliances internationally.
- To ensure strength, stability and durability of life saving appliances.
- To ensure reliability and operational readiness of life saving appliances at all times.
- To provide adequate survival capabilities for all person during abandon ship.

### 17.1, 17.3 SOLAS/LSA Code Requirement

Ques 3) Briefly describe the LSA code requirements relating to personal life saving appliances such as lifejackets, lifebuoys, immersion suits and anti-exposure suits. (5 times)

Ans:- LSA Code requirements of Lifejacket

- A lifejacket shall not burn or continue melting after being totally exposed in a fire for a period of 2 sec.
- Lifejacket shall be provided in three user's size:-

| Lifejacket marking | Infant        | Child                         | Adult       |
|--------------------|---------------|-------------------------------|-------------|
| Weight (KG)        | Less than 15  | 15 or more but less than 43   | 43 or more  |
| Height (cm)        | Less than 100 | 100 or more but less than 155 | 155 or more |

Lifejacket shall be marked by either weight or height, or by both weight & height.

- An adult lifejacket shall be so constructed that:

→ atleast 75% of person can correctly don it within a period of 1 min without assistance, guidance or prior demonstration.

→ after demonstration, all person can correctly don it within a period of 1 min

without assistance

- it is clearly capable of being worn in only one-way.
- the method of securing of lifejacket has quick and positive means of closure which do not require tying of knots.
- it is comfortable to wear.
- it allows wearer to jump into the water from a height of atleast 4.5m while holding the jacket, and from a height of atleast 1m with arm held overhead without injury or damage to lifejacket.
- it allows wearer to swim a short distance and board a survival craft.
- A lifejacket shall have buoyancy which is not reduced by more than 5% after 24h submersion in fresh water.
- Each lifejacket shall be provided with means of securing a lifejacket light.
- Each lifejacket shall be fitted with whistle firmly secured by a lanyard.
- Lifejacket lights and whistles shall be secured to the lifejacket in such a way that their (performance in combination is not degraded) combined use does not affect their performance.
- A lifejacket shall be provided with releasable buoyant line or other means to secure it to a lifejacket worn by another person in water.
- 9 • A lifejacket shall be provided with suitable means to allow rescuer to lift the wearer from the water into a survival craft or rescue boat.
- 10 • Each lifejacket shall be fitted with lights having luminous intensity of 0.75 cd.
- 10 • Lifejacket light shall have source of energy capable of providing a luminous intensity of 0.75 cd for a period of atleast 8h.

LSA code requirement of Lifebuoys.

Every lifebuoy shall:

- have an outer diameter of not more than 800 mm and inner diameter of not less than 400 mm.
- be constructed of inherent buoyant material
- be capable of supporting not less than 14.5 kg of iron in fresh water for a period of 24h.
- have a mass of not less than 2.5 kg

- shall not burn or continue melting after being totally exposed in a fire for a period of 2sec.
- be constructed to withstand a drop into the water from the height at which it is stowed above the waterline in the lightest seagoing condition or 30m, whichever is the greater, without damaging its operating capability and its attachment.
- if attached to a quick release arrangement of self-activated smoke signals and self-igniting lights, have a mass of not less than 4 kg.
- be fitted with grabline whose:
  - thickness shall be not less than 9.5mm
  - length shall be not less than 4 times the outside diameter of the lifebuoy
- The grabline shall be secured at four equidistant points around the circumference of the buoy to form four equal loops.

#### LSA code requirements of Immersion suits

An immersion suit shall be constructed with waterproof materials such that:

- 1 • It can be unpacked and donned without assistance within 2min along with a lifejacket.
  - 2 • It will not burn or continue melting after being totally exposed in a fire for a period of 2sec.
  - 3 • It will cover the entire body except the face.
  - 4 • It should be provided with arrangements to minimize or reduce free air in the legs of the suits.
- 
- 1 • Shall allow the wearer to turn from a face-down to a face-up position in not more than 5s.
  - 2 • Shall allow the wearer to climb up and down a vertical ladder of atleast 5m in length.
  - 5 • Shall allow the wearer to perform normal duties during abandonment.
  - 3 • Shall allow the wearer to jump from a height of not less than 4.5m into the water (without damaging the immersion suit or its attachment)
  - 4 • Shall allow the wearer to swim (a short distance through the water) and board a survival craft.

- 1 • Shall have buoyancy which is not reduced by 5% after 24h submersion in fresh water.
- 2 • Shall have buoyancy to lift the mouth of an exhausted or unconscious person clear off the water by not less than 120mm.

- 1 • An immersion suit not made of material with insulation, shall be  
→ marked with instruction that it must be worn in conjunction with warm clothing.  
→ so constructed that, when worn in conjunction with warm clothing, body temperature should not fall more than 2°C on immersion of 1 hour in water of 5°C.
- 2 • An immersion suit made of material with insulation, shall be  
→ so constructed that, body temperature should not fall more than 2°C on immersion of 6 hours in water of 0°C to 2°C.

#### LSA code requirements of Anti-exposure suits

An anti-exposure suits shall be constructed with waterproof materials such that:

- 1 • It can be unpacked and donned without assistance within 2 min.
  - 2 • It will not burn or continue melting after being totally exposed in a fire for a period of 2 sec.
  - 3 • It will cover the entire body except feet; (covering for hands and head may be provided by separate gloves and a hood, both shall be permanently attached to the suit.)
  - 4 • It should be made of materials which reduces the risk of heat stress during rescue and evacuation operation.
- 
- 0 • Shall allow the wearer to don a lifejacket without assistance.
  - 1 • Shall allow the wearer to turn a face down to a face up position in not more than 5 sec.
  - 2 • Shall allow the wearer to climb up and down a vertical ladder of atleast 5m in length
  - 3 • Shall allow the wearer to jump from a height of not less than 4.5m into the water (without damaging the suit or its attachment)

- 4 • Shall allow the wearer to swim atleast 25m through the water and board a survival craft.
  - 5 • Shall allow the wearer to perform all duties associated with abandonment
  - 1 • It provides inherent buoyancy of atleast 70N
  - 2 • It has a lateral field of vision of atleast 120°
- An anti-exposure suits not made of materials with insulation, shall be  
 → marked with instruction that it must be worn in conjunction with warm clothing.  
 → so constructed that, when worn, body temperature does not fall at a rate of more than 1.5°C per hour after the first 0.5h in water of 5°C.

Ques 4.a) List the requirements for lifeboat as per LSA code. (3 times)

Ans:- LSA code requirement for lifeboat are :-

(i) Construction

- All lifeboats shall be so constructed that they have ample stability in a seaway and sufficient freeboard when loaded with their full complement of persons and equipment.
- All lifeboat shall be capable of being safely launched in trim of upto 10° and list of 20° either way.
- Each lifeboat shall be fitted with permanently affixed approval plate, endorsed by Administration or its representative.
- All lifeboats shall be capable of being launched and towed when the ship is making headway at speed of 5 knots in calm water.
- Hull and rigid covers shall be fire-retardant or non-combustible.
- Lifeboat seating shall be capable of supporting a static load of 100 kg per person (for which it is designed)
- Each lifeboat shall be capable to withstand a lateral impact of atleast 3.5m/sec against ship side & drop into the water from a height of atleast 3m.

(ii) Carrying capacity

- No lifeboat shall be approved to accommodate more than 150 persons.
- The number of person permitted to accommodate shall be lesser of:

→ the number of person having an average weight of 75 kg (for passenger ship) or 82.5 kg (for cargo ship), all wearing lifejacket, that can be seated without interfering the propulsion or operation of lifeboat's equipment.

#### (iii) Access into lifeboat

- Every passenger ship lifeboat shall be so arranged that it can be boarded by its full complement of person in not more than 10 mins from the time the instruction to board is given.
- Every cargo ship lifeboat shall be so arranged that it can be boarded by its full complement of person in not more than 3 mins from the time the instruction to board is given.

#### (iv) Lifeboat buoyancy

- All lifeboat shall have inherent buoyancy, sufficient to float the lifeboat with all its equipment on-board when flooded and open to sea.
- Additional inherently buoyant material, equal to 280N of buoyant force per person, shall be provided for the number of person the lifeboat is permitted to accommodate.

#### (v) Lifeboat stability and free-board

- All lifeboat shall be stable and have a positive GM when loaded with 50% of its permitted capacity - all those persons are seated on one side of centerline.
- The freeboard (measured from the waterline to the lowest opening through which the lifeboat may become flooded) must be at least 1.5% of the lifeboat's length or 100mm, whichever is the greater.

#### (vi) Lifeboat propulsion.

- Every lifeboat is powered by a compression-ignition engine.
- The engine shall be provided with either a manual starting system or a power starting system with two independent rechargeable energy sources.
- The engine shall start within 2 min of commencing the start procedure at ambient temperature of  $-15^{\circ}\text{C}$ .
- The engine shall be capable of operating for not less than 5 mins with lifeboat out of the water.
- The engine shall be capable of operating when lifeboat is flooded upto the centreline of the crankshaft.

- Provision shall be made for ahead and astern propulsion of the lifeboat.
- The speed of lifeboat shall be atleast 6 knots and atleast 2 knots when towing the largest liferaft carried on the ship.
- Sufficient fuel shall be provided to run the fully loaded lifeboat at 6 knots for a period of not less than 24h.

#### (vii) Lifeboat fittings

- All lifeboat shall be provided with atleast one drain valve fitted near the lowest point in the hull.
- All lifeboat shall be provided with a rudder and tiller.
- All lifeboat shall be provided with watertight compartment to provide storage of equipments, water and provisions.
- All lifeboat shall be provided with means for collecting rain water.
- All lifeboat shall be fitted with release mechanism - the release mechanism shall have two release capabilities: normal/off-load & on-load release capability.
- All lifeboat shall be fitted with a device to secure a painter near its bow.
- All lifeboat shall be provided with skates and fender to prevent damage to the lifeboat while launching.
- A manual controlled exterior light shall be fitted, capable of operating continuously for atleast 12h.
- A manual controlled interior light shall be fitted, capable of operating continuously for atleast 12h.
- All lifeboat shall be provided with an adequate view forward, aft, and to both sides from steering position for safe launching and manoeuvring.

#### (viii) Lifeboat equipment

- Sufficient buoyant oars to make headway in calm seas.
- two boat hooks.
- a buoyant bailer and two buckets.
- a survival manual
- an operational compass with suitable means of illumination.
- a sea anchor
- two painter of length not less than twice the distance from the stowed position to the waterline in the lightest seagoing condition or 15m, whichever is the greater.

- two axes (cutting tool)
- 3L of fresh water for each person the lifeboat is permitted to accommodate.
- a rustproof dipper (small container) with lanyard.
- a rustproof graduated (measurement marking) drinking vessel (cup)
- Food ration not less than 10000 KJ for each person the lifeboat is permitted to accommodate.
- Four rocket parachute flares.
- Six hand flares.
- Two buoyant smoke signals.
- One waterproof electric torch with one spare set of batteries and one spare bulb.
- one daylight signalling mirror with instruction for its use.
- one copy of life-saving signals on a waterproof card
- one whistle
- A first-aid kit
- Anti-seasickness medicine.
- One sea sickness bag for each person.
- A folding knife
- Three tin openers
- Two buoyant rescue quirts.
- A manual pump for bailing.
- One set of fishing tackle
- Tools for minor adjustment to the engine and its accessories.
- Portable fire extinguisher suitable for oil fires.
- A searchlight with sector of  $6^\circ$  which can work continuously for not less than 3h
- An efficient radar reflector.
- TPA for 10% of the number of person permitted to accommodate, or two, whichever is the greater.

#### (ix) Lifeboat markings.

- The number of person for which the lifeboat is approved.
- The name and port of registry of the ship on each side of the lifeboat's bow in capital letter of the Roman alphabet.
- Call sign of ship and the number of lifeboat shall be marked in such a way that they are visible from above.

4. b) What are the LSA code requirements regarding markings of lifeboat? (3 times)

Ans:- Answer from 4.a.

4.c) Briefly write about weekly and monthly inspection routine for lifeboat (2 times)

Ans:- Weekly inspection

- All lifeboats shall be moved from their stowed position to the extent necessary to demonstrate satisfactory operation of the launching appliances. This shall be done without any person on-board the lifeboat
- Check the fuel quantity.
- Check the lubricating oil in the engine, as well as, in the gear box.
- Grease the stuffing boxes on the propeller shaft tube fore and aft.
- Check the forward and aft grips are tight, and the safety pins are in place.
- Check that the power supply to the battery charger is ON and the battery switch is OFF
- Check that the emergency lights are working.
- Check that the skates are in position and securing straps of them are in good condition.
- Check that the toggle painter is rigged and secured.
- Check that oars, boathooks and loose gear are in good condition.
- Inspection/maintenance of the on-load release and water spray system.
- Clean the hook parts with fresh water to remove dirt and dust.

Monthly inspection

- All lifeboats shall be turned out monthly from their stowed position. This shall be done without any person on-board the lifeboat.
- Davit and winch shall be lubricated.
- Clean the sight glass
- No air bubbles in the boat compass.
- The drain plug is in place.
- Check the pressure of the air bottles (pressure not less than 150 bar)
- Check the condition of the rubber packing of access hatches.
- Check the connection of the remote control wire.
- Check the navigation light, cabin light and search light are working satisfactorily.
- Check all the seat belts can be adjusted, and the buckle is locking properly.

- Check the inventory as per the inventory list
- Check that lifeboat pyrotechnics are in place, valid, and in good condition.
- Check that lifeboat ration packing is not damaged and has not expired.
- Check the steering from the helm position as well as by emergency tiller.
- Check the extinguishers are secured and free to operate. The date of servicing and pressure test to be checked.
- 15 • Check the dog handles of access hatches are free to operate.
- Check that bilges are clean and dry.
- Try out the bilge pump.
- Check that the warning signs are prominently displayed near the lifeboat winch and at the electrical control panel.
- 20 • Check the condition of the foundation bolts of the davit motor.
- Check that the "hoisting push button switch box" is in satisfactory condition.
- Check that the boat-hoisting handle is in place and in satisfactory condition.
- Check that the boat-lowering lever is rotating freely. Grease if necessary.
- Check the condition of the boarding ladder and its securing arrangements.
- 25 • Check that the toolbox for the engines is in place.

4. d) Briefly describe the LSA code requirement related to on-load release & retrieval system (OLRS) of lifeboats. (2-times)

Ans:- The LSA code requirement related to on-load release & retrieval system of lifeboats are as follows:-

#### ON-LOAD RELEASE SYSTEM

- On-load release system shall release the lifeboat with a load on the hook.
- This release mechanism shall be provided with a hydrostatic interlock.
- In case of failure or when the boat is not waterborne, there shall be means to override hydrostatic interlock. This interlock override capability shall be adequately protected against accidental or premature use. The protection shall be destroyed by applying a minimum force.
- The hydrostatic interlock shall automatically reset upon lifting the boat from the water.
- The hydrostatic interlock shall be designed for a factor of safety of not less than 6 times of maximum operating force.

6. The release mechanism shall be so designed that, when it is fully reset in the closed position, the weight of the lifeboat does not cause any force to be transmitted to the operating mechanism.
7. The locking device shall be so designed that they cannot turn to open due to forces from hook load.
8. The release control shall be clearly marked in a colour that contrasts with its surroundings.

#### RETRIEVAL SYSTEM

- To prevent an accidental release during recovery of the lifeboat, unless the hook is completely reset, either the hook shall not be able to support any load, or the handle or safety pin shall not be able to return to reset position, and any indicator shall not indicate the release mechanism is reset.
- The mechanism shall be so designed that crew member from inside the lifeboat can determine when the system is ready for lifting.
- Clear operating instruction shall be provided using colour coding. Green colour shall indicate a properly reset hook and red shall indicate improper or incorrect setting.

Ques 5) List requirements for Rescue boats as per LSA code? (Chapter V)

Ans:-

- A lifeboat may be approved and used as a rescue boat if it meets all the requirements of rescue boat.
- Rescue boat shall be not less than 3.8m and not more than 8.5m in length.
- Rescue boat shall be capable of carrying at least five seated person and a person lying on a stretcher all wearing immersion suit and lifejacket.
- Rescue boat shall be provided with bow cover extending for not less than 15% of its length.
- Rescue boat shall be capable of manoeuvring at a speed of at least 6 knots.
- Rescue boat shall be provided with sufficient fuel to maintain 6 knots for at least 4 hour (when loaded with its full complement of person & equipment).
- Rescue boat shall be capable of retrieving person from the water, marshal liferaft and tow largest liferaft carried on ship when loaded with its full complement of person and equipment at a speed of at least 2 knots.
- 8. Rescue boat shall be fitted with weathertight storage for small items of equipment.

9. Rescue boat shall be fitted with permanent arrangement for marshalling or towing liferaft as required.
10. Rescue boat shall be provided with adequate view forward, aft and both sides from steering position for safe launching and manoeuvring.

Ques 6-a) With reference to LSA code, enumerate the requirement for construction, stability and markings of inflatable liferafts? (4 times)

(OR),

Briefly describe the LSA code requirements related to construction, marking, packing and stowage of inflatable liferafts including its weak-link arrangement.

Ans:- LSA code requirement regarding liferafts are:-

(i) Construction of inflatable liferafts

- The main buoyancy chamber shall be divided into not less than two separate compartment.
- The buoyancy chamber shall be so arranged that if one compartment got damaged or failed to inflate, the intact compartment shall provide positive freeboard, when loaded with number of persons which the liferaft is permitted to accommodate.
- The floor of the liferaft shall be waterproof and insulated against cold.
- The liferaft shall be capable of being inflated by one person.
- The liferaft shall be inflated with a non-toxic gas.
- The inflation of liferaft shall be completed within a period of 1 min at 18°C to 20°C and within a period of 3 min at -30°C.
- After inflation, the liferaft shall maintain its form when loaded with its full complement of persons and equipment.
- Each inflatable compartment shall be capable of withstanding a pressure equal to atleast three times the working pressure.
- Each inflatable compartment shall be provided with means to prevent reaching twice the working pressure, either by relief valves or by limited gas supply.
- Means shall be provided for fitting the topping-up pump or bellows to maintain the working pressure.

### (ii) stability of inflatable liferaft

- Every inflatable liferaft shall be so constructed that it is stable in a seaway, when fully inflated.
- The stability of the liferaft when in the inverted position, shall be such that it can be righted in a seaway and in calm water by one person.
- The stability of the liferaft when loaded with its full complement of persons and equipment, shall be such that it can be towed at speed of upto 3kts.
- The liferaft shall be fitted with water pockets complying with the following requirements:-
  - Shall be of highly visible colour.
  - shall be such that pocket will fill atleast 60% of their capacity within 25 secs of deployment.
  - For liferaft upto 10 person, the pocket shall have capacity of not less than 220lt.
  - For liferaft more than 10 person, the pocket shall have capacity of not less than  $20N$  ltr, where  $N$  = number of person carried.
  - the pockets shall be positioned symmetrically round the circumference of the liferaft.

### (iii) container for inflatable liferaft (packing and stowage)

- The liferaft shall be packed in a container that is
  - constructed to withstand conditions (encountered) at sea.
  - of sufficient inherent buoyancy
  - watertight, except for drain holes.
- The liferaft shall be packed in its container in such a way that liferaft inflates in an upright position on breaking free from its container.
- The container shall be marked with:-
  - (i) Maker's name
  - (ii) Serial number
  - (iii) Name of approving authority
  - (iv) Number of person it is permitted to carry.
  - (v) SOLAS
  - (vi) type of emergency pack inside
  - (vii) Date when last serviced.
  - (viii) Length of painter

(ix) Mass of the packed liferaft.

(x) Maximum permitted height of stowage above waterline.

(xi) Launching instruction.

(iv) Markings on inflatable liferafts.

• The liferaft shall be marked with :-

(i) Maker's name

(ii) Serial number

(iii) Name of approving authority.

(iv) Number of person it is permitted to accommodate.

(v) Date of manufacture (month and year)

(vi) Name and place of servicing station, where it was last serviced.

• Provisions shall be made for marking each liferaft with name and port of registry, in such a form that ship's identification can be changed at any time, without opening the containers.

(v) Weak link arrangement

If a weak link is used in the float-free arrangement, it shall

→ not broke by force required to pull the painter from liferaft container.

→ be of sufficient strength to permit the inflation liferaft.

→ break under a strain of  $2.2 \pm 0.4$  KN.

6. b) What are the LSA code requirements regarding markings of inflatable liferafts? (3 times)

Ans:- Answer from 6.a

6. c) Briefly write about the weekly and monthly inspection routine for liferafts. (2 times)

Ans:- Weekly inspection.

• Check that all markings are done on liferaft container.

• Check HRU connection and lashing arrangement.

• Check that painter is connected to the weak link of HRU

• Check that the emergency light on the ship side near the fwd liferaft is working.

• Check that railing doors and the chains near the liferafts are not frozen. Grease if necessary.

### Monthly inspection

Carry out following in addition to the weekly routine:

- Clean liferaft container with fresh water.
- Greasing of senhouse slip.
- Try out Hydrostatic release unit (if applicable)

Ques 7) Briefly describe the LSA code requirement relating to life saving appliances, namely, marine evacuation system, Line Throwing Apparatus, Embarkation ladders and Buoyant Smoke Signals.

Ans:- LSA code requirement of Embarkation ladders (6.1.6)

- Handholds shall be provide for safe passage from the deck to the ladder and vice-versa
- The steps of the ladder shall be :
  - made of hardwood, smoothly machined and free from sharp edges.
  - provided with non-slip surface
  - not less than 480 X 115 X 25mm
  - equally spaced not less than 300mm or not more than 380mm
  - secured in such a manner that they will remain horizontal.
- The side ropes of the ladder shall :
  - consist of two uncovered manila ropes of not less than 65mm in circumference on each side.
  - be continuous with no joints
  - be secured at ends to prevent unravelling.

LSA code requirement of Marine Evacuation system (6.2)

A marine evacuation system shall be:

- capable of being deployed by one person
- capable of being deployed from the ship in trim of upto 10° and list of upto 20°, eitherway.
- capable to transfer the total number of persons for which it is designed within 30 mins in passenger ship & 10 min in cargo ship
- capable of providing a satisfactory means of evacuation in sea state associated with a wind of force 6 on the Beaufort scale.

- 5 • designed to remain effective under condition of icing.  
 • so constructed that only a minimum amount of routine maintenance is necessary.  
 • such that liferafts may be securely attached to the platform and released from the platform by the person either in the liferaft or on the platform.
- 8 • if fitted with an inclined slide, the angle of the slide to the horizontal is  $30-35^\circ$  when the ship is upright and in the lightest sea-going condition, and in passenger ship, a maximum of  $55^\circ$  in the final stage of flooding.

#### LSA code requirement of line Throwing Apparatus (7.1)

Every line-throwing appliances shall:

- be capable of throwing a line with reasonable accuracy.
- include not less than four projectiles, each capable of carrying the line atleast 230m in calm weather.
- include not less than four lines, each having a breaking strength of not less than 2kN.
- have brief instructions or diagrams on casing illustrating the use of line-throwing appliances.

#### LSA code requirement of Buoyant smoke signals (3.3)

The buoyant smoke signal shall:

- be contained in a water-resistant casing.
- not ignite explosively.
- have brief instructions or diagrams on casing illustrating the use of buoyant smoke signals.
- emit smoke of highly visible colour at a uniform rate, for not less than 3 min when floating in calm water.
- continue to emit smoke when submerged under 100 mm of water for a period of 10s.
- not emit flame during entire smoke emission time.
- not be swamped in a seaway.

Ques 8 a) Prepare a list of Life saving Appliances required as per SOLAS Chapter III for a chemical tanker built 2010 engaged in International Voyages (2-times)

Ans:- As per SOLAS Chapter III, following life-saving appliances are required:-

(i) Communications

- Two-way VHF radiotelephone
- Search and rescue locating device
- General emergency alarm system
- Public address system

(ii) Visual signal

- Rocket parachute flare
- Hand flare
- Buoyant smoke signal

(iii) Personal life-saving appliances

- Lifebuoys
- Lifejackets
- Immersion suit
- Anti-exposure suit
- Thermal protective aid

(iv) Survival craft

- Inflatable or rigid liferafts
- Totally enclosed lifeboats with self-contained air support system.

(v) Rescue boat (Lifeboat may be accepted as rescue boat if it meets all the requirements of rescue boat).

(vi) Launching appliances

(vii) Embarkation appliances.

(viii) Line-throwing appliances.

(ix) Muster list and emergency instructions

(x) Operating instructions (Posters or signs)

(xi) Instruction for on-board maintenance

(xii) Training manual

Ques 8-b) For bulk carrier built in 2012, engaged on international voyages, prepare a list of LSA as per SOLAS chapter III (2-times)

Ans:- Answer same as 8-a.  
 Except, in (iv) survival craft

- Liferafts
- Lifeboats.

Ques 9) As per chapter III of SOLAS, describe the requirements of 'Training Manual' and 'Instruction for on-board maintenance' of life-saving appliances (2-times)

Ans:- Reg 35: Training manual

- A training manual shall be provided in each crew mess room and recreation room.
- A training manual shall contain instructions and information on the life-saving appliances provided in the ship in easy understood terms.
- A training manual shall contain instructions and information on the best methods of survival.
- The following shall be explained in detail:
  - (i) donning of lifejackets, immersion suit and anti-exposure suits.
  - (ii) muster at assigned stations.
  - (iii) boarding, launching and clearing the survival craft and rescue boat.
  - (iv) release from launching appliances.
  - (v) illumination in launching areas.
  - (vi) methods and use of protection device in launching areas.
  - (vii) use of survival equipment
  - (viii) use of all detection equipment.
  - (ix) use of radio life-saving appliances
  - (x) use of engine and accessories
  - (xi) recovery of survival craft and rescue boat including stowage & securing
  - (xii) best use of survival craft facilities in order to survive.
  - (xiii) hazards of exposure and the need for warm clothing.
  - (xiv) all other functions contained in the muster list and emergency instruction.
  - (xv) Instruction for emergency repair of life-saving appliances.
- The training manual shall be written in the working language of the ship.

Reg 36: Instruction for on-board maintenance

Instruction for on-board shall be easily understood and shall include the following for each appliance:

- a checklist for carrying out the inspection
- maintenance and repair instructions.
- schedule of periodic maintenance
- diagram of lubrication point with recommended lubricant
- list of replaceable parts.
- list of sources of spare parts.
- Log for records of inspection and maintenance.

### 17.2 Muster List/Drill

Ques 10) Prepare an emergency muster list for a ship which has a total complement of 20 persons taking into account all the requirements of muster list and emergency instructions specified in chapter III of SOLAS **(5 times)**

(OR),

Prepare an Emergency Muster List for a ship with a total complement of 21 (4 Deck Officers (including Master), 4 Engineers Officers, Electrician, 5 Deck ratings, 3 Engine Ratings, 2 Catering Ratings, 1 Deck and a Engine cadet). Ensure all the information as required by SOLAS is shown **(4 times)**

(OR),

Prepare an Emergency Muster List for ship with a total complement of 25 persons.

Ans:- As per Regulation 37: Muster List and emergency instruction in chapter III of SOLAS

SHIP'S NAME: M.T MUSTER

General Emergency Alarm: seven or more short blasts following by one long blast on the ship's whistle or siren.

Fire Alarm: Continuous ringing of an electrically operated bell

Abandon ship signal: General Emergency Alarm signal followed by the spoken word "ABANDON SHIP X 3" by master of the vessel or chief officer in the event of incapacity of master.

Muster & Reporting: On hearing the alarm signal, all personnel shall report to their designated muster station, carrying their lifejacket and dressed in boiler suit, safety shoes and safety helmet. All team leader must report to command team as their team are assembled at muster stations.

### COMMAND TEAM

PRIMARY MUSTER LOCATION: WHEEL HOUSE

SECONDARY MUSTER LOCATION: BRIDGE WING (STBD SIDE)

| S.NO. | NAME | RANK                | DUTIES OF SHIPBOARD PERSONNEL     |                                  |   |                                  |
|-------|------|---------------------|-----------------------------------|----------------------------------|---|----------------------------------|
|       |      |                     | FIRE                              | POLLUTION                        | DAMAGE TO SHIP/<br>CARGO RELATED ACCIDENT | PERSONNEL ACCIDENT               |
| 1     |      | MASTER              | DIC                               | OIC                              | OIC                                       | OIC                              |
| 2     |      | 3 <sup>RD</sup> OFF | ASSIST MASTER/<br>COMM. & RECORDS | ASSIST MASTER/<br>COMM & RECORDS | ASSIST MASTER/<br>COMM & RECORDS          | ASSIST MASTER/<br>COMM & RECORDS |
| 3     |      | SHM-1               | HELSMAN/<br>AS DIRECTED           | HELSMAN/<br>AS DIRECTED          | HELSMAN/<br>AS DIRECTED                   | HELSMAN/<br>AS DIRECTED          |
| 4     |      | D/CDT               | LOOKOUT/<br>MESSENGER             | LOOKOUT/<br>MESSENGER            | LOOKOUT/<br>MESSENGER                     | LOOKOUT/<br>MESSENGER            |

### TECHNICAL TEAM

PRIMARY MUSTER LOCATION: ENGINE CONTROL ROOM

SECONDARY MUSTER LOCATION: UPPER DECK STBD SIDE

|   |  |       |   |   |   |   |
|---|--|-------|---|---|---|---|
| 1 |  | CEO   | LEADER  | LEADER  | LEADER  | LEADER  |
| 2 |  | 3EO   | ASSIST CEO/MANNED ECR/<br>START OR STOP MACHINERY | ASSIST CEO/MANNED ECR/<br>START OR STOP MACHINERY | ASSIST CEO/MANNED ECR/<br>START OR STOP MACHINERY | ASSIST CEO/MANNED ECR/<br>START OR STOP MACHINERY |
| 3 |  | ETO   | TRIPS/EMG POWER                                   | TRIPS/EMG POWER                                   | TRIPS/EMG POWER                                   | TRIPS/EMG POWER                                   |
| 4 |  | DGR-1 | VENTS/<br>AS DIRECTED                             | DECK AIR AND<br>WELDEN PUMP                       | VENTS/<br>AS DIRECTED                             | VENTS/<br>AS DIRECTED                             |
| 5 |  | TME   | AS DIRECTED                                       | AS DIRECTED                                       | AS DIRECTED                                       | AS DIRECTED                                       |

### EMERGENCY TEAM I

PRIMARY MUSTER STATION: UPPER DECK PORT SIDE

SECONDARY MUSTER STATION: UPPER DECK STBD SIDE

|       |  |        |                                       |                          |  |                     |
|-------|--|--------|---------------------------------------|--------------------------|--|---------------------|
| 1     |  | CH OFF | LEADER                                | LEADER                   | LEADER                                 | LEADER              |
| 2     |  | SHM-2  | SCBA/<br>FIREMAN'S OUTFIT             | SCUPPER/<br>SAW DUST     | SCBA/<br>FIREMAN'S OUTFIT              | SCBA/<br>EVACUATION |
| 3     |  | DGR-2  | SCBA/<br>FIREMAN'S OUTFIT             | DECK AIR/<br>WELDEN PUMP | SCBA/<br>FIREMAN'S OUTFIT              | SCBA/<br>EVACUATION |
| 4     |  | OS-1   | ASSIST FIREMAN                        | SHOVELS/<br>SCOOP        | ASSIST FIREMAN/<br>CLOSE VENTS & FLAPS | STRETCHER           |
| (A) 5 |  | P/MAN  | BRING EXTINGUISHER/<br>RIG FIRE HOSES | OIL BOOM/<br>SAW DUST    | SOUNDING                               | PREP. RECOVERY GEAR |

### EMERGENCY TEAM II

PRIMARY MUSTER STATION: UPPER DECK PORT SIDE

SECONDARY MUSTER STATION: UPPER DECK STBD SIDE

|       |  |       |                                       |                            |                                   |                     |
|-------|--|-------|---------------------------------------|----------------------------|-----------------------------------|---------------------|
| 1     |  | 2EO   | LEADER                                | LEADER                     | LEADER                            | LEADER              |
| 2     |  | 4EO   | ASSIST FIREMAN                        | DECK AIR/<br>WELDEN PUMP   | ASSIST FIREMAN/<br>DAMAGE CONTROL | PREP. HOSPITAL      |
| 3     |  | SHM-3 | SCBA/<br>FIREMAN'S OUTFIT             | SCUPPER/<br>SAW DUST       | SCBA/<br>FIREMAN'S OUTFIT         | SCBA/<br>EVACUATION |
| 4     |  | DGR-3 | SCBA/<br>FIREMAN'S OUTFIT             | BUCKETS, DRUMS             | SCBA/<br>FIREMAN'S OUTFIT         | SCBA/<br>EVACUATION |
| (A) 5 |  | ERPO  | BRING EXTINGUISHER/<br>RIG FIRE HOSES | ABSORBENT PAD/<br>SAW DUST | SOUNDING                          | RESUSCITATOR        |

### SUPPORT TEAM

PRIMARY MUSTER LOCATION: UPPER DECK PORT SIDE

SECONDARY MUSTER LOCATION: UPPER DECK STBD SIDE

|   |  |          |                                  |                          |                            |                         |
|---|--|----------|----------------------------------|--------------------------|----------------------------|-------------------------|
| 1 |  | CH COOK  | LEADER                           | LEADER                   | LEADER                     | LEADER                  |
| 2 |  | G/S      | FIRST AID/<br>STRETCHER          | FIRST AID/<br>STRETCHER  | FIRST AID/<br>STRETCHER    | FIRST AID/<br>STRETCHER |
| 3 |  | TR. COOK | BOUNDARY COOLING/<br>AS DIRECTED | SAW DUST/<br>AS DIRECTED | EMG. TOOLS/<br>AS DIRECTED | BLANKET/<br>AS DIRECTED |

### BOAT PREPARATION TEAM

PRIMARY MUSTER LOCATION: UPPER DECK STBD SIDE

SECONDARY MUSTER LOCATION: UPPER DECK PORT SIDE

|   |  |                     |                                 |                                 |                                |                                |
|---|--|---------------------|---------------------------------|---------------------------------|--------------------------------|--------------------------------|
| 1 |  | 2 <sup>ND</sup> OFF | LEADER                          | LEADER                          | LEADER                         | LEADER                         |
| 2 |  | OS-2                | PAINTER/CRADLE<br>CLAMP/LOWERER | PAINTER/CRADLE<br>CLAMP/LOWERER | PAINTER/CRADLE<br>CAMP/LOWERER | PAINTER/CRADLE<br>CAMP/LOWERER |
| 3 |  | D/CDT               | CHARGING PLUG/<br>DRAIN PLUG    | CHARGING PLUG/<br>DRAIN PLUG    | CHARGING PLUG/<br>DRAIN PLUG   | CHARGING PLUG/<br>DRAIN PLUG   |

Note:

Officer In-charge of Training: Chief Officer

Officer responsible for Safety Equip. Maintenance: 3<sup>RD</sup> officer/4<sup>th</sup> Eng.

Substitute for Team leader: FOR MASTER - CH OFFICER

FOR CH OFF - 2<sup>ND</sup> OFFICER

FOR CH ENG - 2<sup>ND</sup> ENG.

SUPERNUMERIES TO REPORT ON BRIDGE

Ques 11) How will you organize and conduct the abandon ship drill and fire drill as per SOLAS. (4-times)

(OR),

As per SOLAS how will you ensure to conduct a abandon ship drill & fire drills in a realistic manner? (4-times)

- Ans:-
- \* Drills shall be conducted as if there was an actual emergency.
  - \* Every crew member shall participate in atleast one abandon ship drill and one fire drill every month.

#### ABANDON SHIP DRILL

• Each abandon ship drill shall include:

- (i) Sounding of alarm followed by drill announcement on the PA system.
- (ii) Mustering and reporting at designated muster station.
- (iii) Preparing for duties as per muster list

- (iv) Checking that crew are suitably dressed.
  - (v) Checking that lifejackets are correctly donned.
  - (vi) Lowering of atleast one lifeboat after necessary preparation for launching.
  - (vii) Starting and operating of lifeboat engine
  - (viii) Operation of davits used for launching liferafts.
  - (ix) Use of radio life-saving appliances.
- Different lifeboat shall be lowered at successive drills.
  - Each lifeboat shall be launched and manoeuvred in water by its assigned operating crew, atleast once every three months during an abandon ship drill.
  - Emergency lighting for mustering and abandonment shall be tested at each abandon ship drill.

### FIRE DRILL

- Fire drill shall be planned in such a way that due consideration is given to various emergencies that may occur depending on the type of ship and cargo.
- Each fire drill shall include :
  - (i) Sounding of alarm followed by drill announcement on the PA system.
  - (ii) Mustering & reporting at designated muster station.
  - (iii) Preparing for duties as per muster list
  - (iv) Starting of fire pump.
  - (v) Using atleast two jets of water to show that the system is in good <sup>working</sup> order.
  - (vi) Checking of SCBA/ Fireman's outfit.
  - (vii) Checking of relevant communication equipment.
  - (viii) Checking the operation of watertight doors, fire doors, fire dampers and main inlet and outlet of ventilation system in drill area.
- The equipment used during drill shall immediately be brought back to its fully operational condition.
- Any faults or defects observed during the drill shall be rectified as soon as possible.

Ques) What is the methodology, you as a chief officer, will adopt to make a various drill more realistic?

Ans:- Same as Ques No. 11.

Ques 12) Prepare an Annual Drill Planner for conducting all the drills as per SOLAS, MARPOL and ISPS codes. (7 times)

Ans:-

| VESSEL:              |  | YEAR: |     |     |     |     |     |     |     |     |     |     |     |     |
|----------------------|--|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| NATURE OF EMERGENCY  |  | FREQ. | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| ABANDON SHIP         | Boat Muster                                | 1M    | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
|                      | Lowering/operating lifeboat away from ship | 3M    |     |     | ✓   |     |     | ✓   |     |     | ✓   |     |     | ✓   |
| FIRE                 | Cargo fire in a tank/on deck               |       | ✓   |     |     |     |     |     | ✓   |     |     |     |     |     |
|                      | Fire in Engine Room                        |       |     | ✓   |     |     |     |     |     | ✓   |     |     |     |     |
|                      | Fire in Pumproom                           | 1M    |     |     | ✓   |     |     |     |     |     | ✓   |     |     |     |
|                      | Fire in accommodation                      |       |     |     |     | ✓   |     |     |     |     |     | ✓   |     |     |
|                      | Fire in Galley                             |       |     |     |     |     | ✓   |     |     |     |     |     | ✓   |     |
|                      | Fire at Crane/FPK store/Paint room         |       |     |     |     |     |     |     | ✓   |     |     |     |     | ✓   |
| POLLUTION            | Pollution by cargo/bunkers, SOPEP          | 1M    | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| CARGO RELATED        | Explosion                                  | 6M    |     |     |     | ✓   |     |     |     |     |     | ✓   |     |     |
|                      | Toxic Gas/vapour Emission                  | 6M    |     |     |     |     | ✓   |     |     |     |     |     | ✓   |     |
| EMERGENCY ASSISTANCE | Assistance to Vessel/Aircraft in distress  | 6M    |     |     |     | ✓   |     |     |     |     |     | ✓   |     |     |
|                      | Helicopter accident                        | 6M    |     |     |     |     | ✓   |     |     |     |     |     | ✓   |     |
| PERSONNEL ACCIDENTS  | Serious Injury                             | 3M    | ✓   |     |     | ✓   |     |     | ✓   |     |     | ✓   |     |     |
|                      | Man overboard/Search & Rescue              | 3M    |     | ✓   |     |     | ✓   |     |     | ✓   |     |     | ✓   |     |
|                      | Enclosed space entry & Rescue              | 2M    | ✓   |     | ✓   |     | ✓   |     | ✓   |     | ✓   |     | ✓   |     |
| UNLAWFUL INCIDENTS   | Terrorism                                  | 6M    | ✓   |     |     |     |     |     | ✓   |     |     |     |     |     |
|                      | Piracy                                     | 6M    |     | ✓   |     |     |     |     |     | ✓   |     |     |     |     |
|                      | Stowaway                                   | 6M    |     |     | ✓   |     |     |     |     |     | ✓   |     |     |     |
| CYBER INCIDENTS      | Gyro Compass Failure                       | 6M    |     |     |     | ✓   |     |     |     |     |     | ✓   |     |     |
|                      | Ecdis failure drill                        | 6M    |     |     |     |     | ✓   |     |     |     |     |     | ✓   |     |
|                      | Cyber security drill                       | 3M    |     |     | ✓   |     |     | ✓   |     |     | ✓   |     |     | ✓   |
|                      | Collision                                  | 6M    |     |     |     |     |     |     | ✓   |     |     |     |     |     |
| DAMAGE TO SHIP       | Grounding/Stranding                        | 6M    |     |     |     |     |     |     | ✓   |     |     |     |     |     |
|                      | Structural Failure                         | 6M    |     |     |     |     |     |     |     | ✓   |     |     |     |     |
|                      | Flooding                                   | 6M    |     |     |     |     |     |     |     |     | ✓   |     |     |     |
|                      | Heavy weather damage                       | 6M    |     |     |     |     |     |     |     |     |     | ✓   |     |     |
|                      | Main engine failure                        | 6M    |     |     |     |     |     |     |     |     |     |     | ✓   |     |
|                      | Electrical power failure                   | 6M    |     |     |     |     |     |     |     |     |     |     |     | ✓   |
|                      | Steering gear failure                      | 3M    |     | ✓   |     |     |     | ✓   |     |     | ✓   |     | ✓   |     |

- In addition to the drill listed above, vessel shall conduct SOPEP/SMPEP training every fortnight (two weeks)
- Fire and abandon ship drill should be carried out within 24 hours of departure if more than 25% of the crew have not participated in drill in previous months.
- Combination of the drill is allowed.

Ques 13.a) How abandon ship drill organized in a ship where free-fall lifeboat is in provisions?

- Ans:-
- At least once every three months, during abandon ship drill the crew should board the lifeboat, properly secure themselves in their seats and commence launch procedure but not release the hook of the lifeboat.
  - The lifeboat shall then either be free-fall launched with only the required operating crew on-board, or, lowered into the water by secondary means of launching with or without the operating crew on-board.
  - In both cases, the lifeboat shall thereafter be manoeuvred in the water.
  - At interval of not more than 6 months, the lifeboat shall either be launched by free-fall with only the operating crew on-board, or, simulated launching shall be carried out as per the guidelines developed by the organization.

Ques 13.b) Give a detailed debriefing of the drill conducted with suggestion if any for improvement?

- Ans:-
- Fire in accommodation: Master informed the importance of immediately closing the weathertight doors, flaps and dampers that provide ventilation to accommodation as it prevent spreading as well cutting off the air support to fire
- Abandon ship drill: Importance of removing the battery charging cable before starting the lifeboat engine. Importance of fasten seat belt inside the lifeboat.
- Suggestion for improvement
- Flooding in machinery space: The emergency bilge pump arrangement to be used to remove flooding in engine room.
- Enclosed space rescue: Improvisation of time in putting the casualty on stretcher and lifting until on deck.
- Cyber security drill: Blocking of all USB ports. No unauthorized pendrive and hard drive to be used.

## Q. 2. Competence no. 17.6 (SHIP SAFETY AND SECURITY)

(Page No 44 to 70)

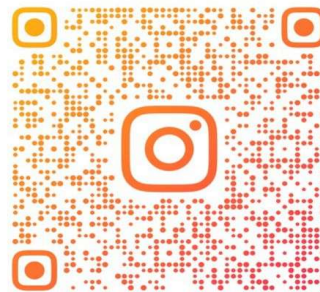


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## Q.2. Competence no. 17.6 (Ship safety and security)

### ISPS CODE

Ques 1) What are the salient features of the ISPS Code to ensure the security of the ship's crew and passengers? (6 times)

Ans:- The salient features of ISPS code to ensure the security of the ship's crew and passenger are as follows:-

#### (i) Declaration of Security (DOS)

- It is agreement between ship and port/other ships.
- It defines security responsibilities.

#### (ii) Security Levels

- Three security levels (Level 1, 2 & 3) are specified.
- Security level is raised as risk of a security incident increases.
- Security measures increases with security levels.

#### (iii) Ship security assessment (SSA)

- It is the process of developing and updating the security plan.
- It includes identification of possible threats to the key ship board operations and the likelihood of their occurrence.
- It is done in order to establish and prioritise security measures.

#### (iv) Ship security plan (SSP)

- Every ship shall carry a ship security plan approved by the Administration.
- It includes procedure for access control, responding to security threat, reporting security incidents, training drills and exercises.
- It identifies the Ship security officer (SSO), Company security officer (CSO), restricted areas and location of SSAs activation points.

#### (v) Company security officer (CSO)

- The CSO shall ensure development, approval, implementation and modification as if required of ship security plan.
- The CSO will arrange for internal audits, reviews and verification by Administration or Recognized Security Organization (RSOs)
- The CSO shall ensure adequate training for personnel responsible for the security of the ship.

#### (vi) Ship security officer (SSO)

- A SSO is responsible for implementing and maintaining ship security plan.
- A SSO is responsible for co-ordinating the security aspects of the handling of cargo and ship's store with other shipboard personnel.
- A SSO is responsible for carrying out regular security inspections of the ship to ensure appropriate security measures are maintained.
- A SSO is responsible for reporting all security incidents.
- A SSO is responsible for ensuring that security equipment is properly operated, tested, calibrated and maintained.

#### (vii) Port Facility security officer

- A PFSO is responsible for development, implementing and maintaining port facility security plan.
- A PFSO is responsible for co-ordinating with ships during port operations.
- A PFSO is responsible for carrying out regular security inspections of the port facility to ensure appropriate security measures are maintained.
- A PFSO is responsible for reporting all security incidents to the relevant authorities and maintaining record of occurrences.
- A PFSO is responsible for ensuring that security equipment is properly operated, tested, calibrated and maintained.

#### (viii) Security equipment

- It consists of alarm, communication system and ship security alert system.
- It is used to immediate alert to authorities in case of threat.

#### (ix) Training, drills and exercises.

- Training, drills and exercises shall be carried out at appropriate intervals to ensure the effective implementation of the ship security plan.
- It ensures preparedness for emergencies like piracy, terrorism and stowaways.

#### (x) Verification and certification

- A ship is subject to verification of its security system and associated security equipment to ensure ship fully complies with the requirements of ISPS code.
- An International Ship Security Certificate (ISSC) shall be issued after the initial or renewal verification by the Administration or by a recognized security organization on behalf of the Administration.

Ques 2) With respect to ISPS code, explain the following:

a) Ship security assessment (7 times)

- Ans:-
- The ship security assessment is the process of developing and updating the ship security plan.
  - The company security officer shall ensure that the ship security assessment is carried out by a person with expertise to evaluate the security of a ship.
  - Recognized security organization (RSO) may carry out the ship security assessment of a specific ship.
  - The ship security assessment shall include an on-scene security survey and the following elements:
    - identification of existing security measures, procedures and operations.
    - identification and evaluation of key shipboard operations that it is important to protect.
    - identification of possible threats to the key shipboard operations and the likelihood of their occurrences.
  - It is done in order to establish and prioritize security measures.
  - The ship security assessment shall be documented, reviewed, accepted and retained by the Company.

b) Ship security plan (7 times)

bb) Procedure for amendment of ship security plan (2 times)  
(OR),

As per the ISPS code, what are the contents of the ship security plan? (3 times)  
(OR),

How is a ship security plan made and what are its contents and draw procedure for its revision.

- Ans:-
- Every ship shall carry a ship security plan approved by the Administration.
  - Recognized security organization may prepare the ship security plan.
  - The administration may entrust the review, approval or any amendments of ship security plan to recognized security organizations.
  - The recognized security organization carrying out the review, approval or any amendment of ship security plan shall not be involved in preparation of ship security plan.
  - SSP shall be written in the working language of the ship. If the language

used is not English, French or Spanish, a translation into one of these languages shall be included.

- The plan shall be protected from unauthorized access or disclosure.

### Contents of ship security plan

The plan shall address, atleast, the following:

- (i) identification of the restricted areas and measure for the prevention of unauthorized access to that.
- (ii) measure for the prevention of unauthorized access to the ship.
- (iii) procedure for responding to security instructions at security level 3.
- (iv) procedure for responding to security threats or breaches of security.
- (v) procedure for evacuation in case of security threats or breaches of security.
- (vi) duties of shipboard personnel on security aspects.
- (vii) procedure for training, drills and exercises associated with the plan
- (viii) procedure for interfacing with port facility security activities.
- (ix) procedure for the periodic review and updating of the plan
- (x) procedure for reporting security incidents.
- (xi) identification of the ship security officer.
- (xii) identification of the company security officer including 24-hour contact details.
- (xiii) identification of the locations of ship security alert system activation points.
- (xiv) procedures, instructions and guidance on the use of the ship security alert system, including testing, activation, deactivation and resetting.
- (xv) procedure and frequency for inspection, testing, calibration, and maintenance of any security equipment provided on-board.

### Procedure for amendment of Ship security plan

- Any changes to an approved SSP shall be reported by the CSO to the relevant RSO.
- The RSO decides if the change shall be effectuated with or without new verification.
- The changes which does not require a consequential verification, shall be approved by the master or the SSO and the CSO.
- A declaration signed by the CSO then be added to the plan and pages shall be signed by the SSO or the master.
- These changes will be evaluated by the RSO during the next intermediate or renewal verification.
- In case changes do need approval and/or verification by the RSO, the pages subject to adjustment shall be stamped by the RSO.

c) Security Levels and Duties and responsibilities of every individual at various Security levels (11 times)

Ans:- Security Level 1: Normal - the level at which ships and port facilities normally operate.

Security level 2: Heightened - the level applying for as long as there is a heightened risk of security incident.

Security level 3: Exceptional - the level applying for the period of time when there is the probable or imminent risk of a security incident.

Duties and responsibilities of CSO

write answer from 3-b

Duties and responsibilities of SSO

write answer from 3-a

Duties and responsibilities of shipboard personnel detailed for Gangway duty and/or security patrol:

At security level 1:

- Checking the identity of all persons and confirming their reason to board the ship.
- The frequency of such searches should be specified in the approved SSP.
- All access point should be secured or attended to prevent unauthorized access.
- 4 • Access to restricted areas should be locked/secured.
- 5 • Routine checks and verification to ensure the cargo/stores being loaded matches the cargo/stores documentation.
- 6 • Security patrol shall be made throughout the ship at 4 hours interval.

At security level 2:

- Limit the number of access points to the ship.
- Increase the frequency of searches and conduct detailed search of personal effects for all persons being embarked onto the ship.
- Escort visitors on the ship.
- 4 • Establish a restricted area on the shore side of the ship.
- 5 • Detailed and intensified checks and verification of cargo/stores being loaded.
- 6 • Security patrol shall be made throughout the ship at interval not exceeding 30 minutes.
- Additional person to guard and patrol the restricted areas.
- 8 • Carry out a full or partial search of the ship.

### At security level 3:

- Limit the access to a single controlled access point.
- Suspend embarkation and disembarkation.
- Grant access only to those responding to the security incident or threat.
- 4 • Set up additional restricted areas on the ship in proximity to the security incident, or the believed location of the security threat.
- 5 • Suspend cargo operation and store deliveries etc.
- 6 • SSO should employ additional security staff and provide constant monitoring of ship's restricted areas.
- Close monitoring of the movement of people on-board, and, guide persons on-board to safe area.
- 8 • Prepare for a full or partial search of the ship.

### Duties and responsibilities of other shipboard personnel.

- All ship's personnel are responsible for following the standing instruction of the Master/SSO on security.
- Report any unusual activity.
- Ensure the security of their cabin spaces.

### Duties and responsibilities of officer of the watch (OOW)

- Ensure access control.
- Ensure gangway is properly rigged, lit and monitored.
- Ensure lighting of deck and access point is adequate during hours of darkness.
- Ensure proper monitoring of restricted areas and unauthorized entry is prevented.
- Ensure periodic deck patrol to detect tampering, stoways and suspicious activity.
- Ensure cargo operations comply with security procedures and no suspicious items are loaded.
- Supervise handling of ship stores, spares and bunkers from a security perspective.
- Ensure security level requirement (Level 1, 2 or 3) are implemented, as per SSP.
- Keep security log/records of visitors, incident and patrols.
- Immediately report any security breach, threat or suspicious activity to Master/SSO.

Ques 3-a) Enumerate the duties & responsibilities of ship security officer (SSO). (8times)  
 (OR),

As a ship security officer, how will you ensure the security of the vessel? (2times)

Ans:- The duties and responsibilities of SSO include, but not limited to the following:-

- 1) Undertaking regular security inspections of the ship to ensure that appropriate security measures are maintained.
- 2) Co-ordinating security aspects of handling of cargo and ship's stores with shipboard personnel and the relevant PFSO.
- 3) Co-ordinating implementation of the SSP with the CSO and the relevant PFSO.
- 4) Conducting on-board reviews of SSA and SSP.
- 5) Proposing modifications to the SSP.
- 6) Reporting any deficiencies and non-conformities to the CSO found during internal audits, periodic reviews, security inspections and verifications of compliance and implementing any corrective actions.
- 7) Reporting all security incidents.
- 8) Ensuring that adequate training has been provided to shipboard personnel.
- 9) Ensuring that adequate resources are available for maintaining watches and/or security patrols.
- 10) Ensuring that personnel are aware of their responsibilities and duties concerning security.
- 11) Ensuring that security equipment is properly operated, tested, calibrated and maintained.
- 12) Ensuring periodic testing of the effectiveness of the security plan by conducting drills.

3-b) What are the roles and responsibilities of the CSO?

Ans:- The duties and responsibilities of CSO include, but not limited to the following:-

- 1) Advising the level of threats likely to be encountered by the ship, using appropriate security assessments and other relevant information.
- 2) Ensuring effective communication and co-ordination between the SSO and the relevant PFSO.
- 3) Ensuring co-ordination of the implementation of the SSP with the SSO and the relevant PFSO.
- 4) Ensuring that ship security assessments are carried out.

- 5) Ensuring the development, the submission for approval, and thereafter the implementation and maintenance of the ship security plan.
- 6) Ensuring that deficiencies and non-conformities found during internal audits, periodic reviews, security inspections and verification of compliance are promptly addressed and corrective action implemented.
- 7) Establishing reporting and recording procedures.
- 8) Ensuring adequate training has been provided to personnel responsible for the security of the ship.
- 9) Arranging for internal audits and reviews of security activities.
- 10) Arranging for the initial and subsequent verifications of the ship by the Administration or the RSO.
- 11) Ensuring that, if sister-ship or fleet security plans are used, the plan for each ship reflects the ship-specific information accurately.
- 12) Ensuring that any alternative or equivalent arrangements approved for a particular ship or group of ships are implemented and maintained.

Ques 4) With respect to ISPS code, what are the obligations of the ships, terminal and the shipping companies? (2 times)

Ans:- With respect to ISPS code, the obligations of the ships, terminal and the shipping companies are as follows:-

\* Obligation of the ships

- (i) Declaration of Security (DOS)
- (ii) Security Levels
- (iii) Ship security assessment (SSA)
- (iv) Ship security Plan (SSP)
- (v) Ship security officer (SSO)
- (vi) Training drills and exercises.
- (vii) Verification and certification.

} From Ques. 1

\* Obligations of Port Facilities (terminal)

(i) Port facility security level

- Three security level (level 1, 2, 3) are specified.
- Port facility security level are set by contracting government of that territory.
- Security level is raised as risk of a security incident increases.

(ii) Port Facility Security Assessment (PFSA)

- It is the process of developing and updating the port facility security plan.
- It includes identification of possible threats to the assets and infrastructure and the likelihood of their occurrence.
- It is done in order to establish and prioritise security measures.

(iii) Port Facility Security Plan (PFSP)

- Every port facility shall develop and maintain a port facility security plan approved by the Contracting Government.
- It includes procedures for access control, responding to security threat, reporting security incidents, training drills and exercises.
- It identifies Port Facility Security Officer (PFSO)

(iv) Port Facility Security Officer (PFSO)

(v) Training, drills and exercises on port facility security

} From Ques 1

\* Obligations of the Shipping companies.

(i) The company shall provide information to the master of the ship regarding

- ship management companies
- manning agents
- parties responsible for deciding the employment of the ship.
- contact details of charterer.

(ii) The company is obliged to update and keep this information current as and when changes occur.

(iii) The company shall ensure that the ship security plan contains a clear statement focusing on the master's authority.

(iv) The company shall establish in the ship security plan that the master has the overriding authority and responsibility to make decisions with respect

- to the safety and security of the ship
- to request the assistance of the company or of any contracting government as when necessary.

(v) The company shall ensure that the CSO, SSO and the master are given the necessary support to fulfil their duties and responsibilities in accordance with the ISPS code.

## ISM CODE

Ques 5.a) Describe the functional requirements of ISM code. (2 times)

Ans:- Every company should develop, implement and maintain a safety management system which includes the following functional requirements:

- a safety and environmental protection policy
- defined level of authority.
- defined lines of communication between shore and shipboard personnel.
- procedures to ensure safe operation of ships and protection of the environment.
- procedures to prepare for and respond to emergency situations.
- procedures for internal audits and management reviews.
- procedures for reporting accidents and non-conformities.

5.b) Describe the objectives of ISM code.

Ans:- The objectives of ISM code are:

- to ensure safety at sea.
- to prevent human injury, loss of life, damage to the marine environment and damage to the property.
- to provide standard for safe practices in ship operation and a safe working environment.
- to assess all identified risks to the ship, personnel and the environment.
- to establish safeguard against all identified risks.
- to continuously improve safety management skills of personnel ashore and aboard ships.
- to prepare the personnel for emergencies related (both) to safety and environmental protection.

5.c) List the various elements of the ISM code.

Ans:- The various elements of the ISM code are as follows:-

(i) General

- Objective of the code.
- Functional requirement of the code.

(ii) Safety and Environmental protection policy.

- The company should establish a safety & environmental protection policy.
- The company should ensure that the policy is implemented and maintained at all levels of organization.

(iii) Company responsibilities and authority.

- The company should define responsibility and authority of all personnel who perform work related to safety and pollution prevention.
- The company is responsible for ensuring that adequate resources and shore-based support are provided to enable the designated person to carry out their functions.

(iv) Designated Person(s)

- Appoint a Designated Person Ashore (DPA) which acts as a link between company and those on-board.
- Designated person shall have a direct access to the highest level of management.
- The duties and responsibilities of DPA is to monitor safety and pollution prevention aspects of each ship.
- DPA shall ensure adequate resources and shore based support are provided.

(v) Master's responsibility and authority.

- Master shall implement the safety and environmental policy of the company.
- Master shall periodically review the safety management system and report its deficiencies to the shore based management.
- The company should ensure that the SMS onboard ship contains a clear statement emphasizing the master's authority.
- Master has the overriding authority and responsibility to make decisions with respect
  - to safety and pollution prevention
  - to request the company's assistance as when necessary.

(vi) Resources and Personnel

The company shall ensure

- Master is properly qualified for command.
- Ship is manned with qualified, trained and medically fit crew.

(vii) Shipboard operations

- The company should establish procedures, plans and instructions, including checklists for key shipboard operations.

• The various tasks should be defined and assigned to qualified personnel.

#### (viii) Emergency Preparedness

- The company should identify potential emergencies and establish procedures to respond to them.
- The company should establish programmes for drills and exercises to prepare for emergency actions.

#### (ix) Reports and Analysis of Non-conformities, Accidents & Hazardous Occurrences

- The company should include procedure for reporting non-conformities, Accidents & Hazardous Occurrences.
- The company should establish procedure for the implementation of corrective and preventive actions for the same.

#### (x) Maintenance of the ship and Equipment

- The company should establish procedure for maintenance of ship and machinery.
- The company should ensure regular inspections are held and records are maintained.

#### (xi) Documentation

- The company should ensure that all the documents are valid.
- The company should ensure the changes to documents are reviewed and approved by authorized personnel.

#### (xii) Company verification, Review and Evaluation

- The company should carry out internal safety audits on-board and ashore at intervals not exceeding twelve months.
- The company should periodically review and evaluate the effectiveness of the SMS.

Ques 6-a) State the criteria for appointing a safety officer and explain in detail his responsibilities in ensuring safety on-board. (6-times)

Ans:- The criteria for appointing a safety officer are as follows:-

- Must be a certified officer holding a valid Certificate of competency.
- Should have completed a shore based Safety officer's course.
- Should have sufficient experience on-board ship - atleast 6 month on such ship.
- Should have good knowledge of shipboard operations.

- Must be familiar with ship's safety, occupational Health & Environmental committee.
- Any seagoing ship employing five or more seafarers, the company must appoint a safety officer.

The responsibilities of safety officers in ensuring safety on-board are as follows:

- 1) Ensure all ship's personnel are provided safety and task familiarisation.
- 2) Enforce all safety and pollution prevention rules and regulations.
- 3) Encourage ship's staff to give suggestions for improving safety and pollution prevention.
- 4) Take corrective/preventive action to eliminate unsafe practices.
- 5) Stop any work they reasonably believe that may cause a serious accident and immediately inform the Master.
- 6) Shall conduct safety inspections atleast once every month covering all parts of the vessel.
- 7) Investigate accidents and near misses/hazardous occurrences occurring on-board and recommend proposals to Master to prevent recurrence of same.
- 8) Investigate all complaints made by shipboard personnel concerning safety.
- 9) The functioning of the ship's safety, occupational health and Environmental committee.
- 10) The risk assessment shall be approved by safety officers, in consultation with Master, for all shipboard operations.

6-b) As a safety officer, list the various responsibilities and duties you are required to fulfill. Enumerate some proactive measures you will take to enhance safety awareness and compliant on-board. (4-times).

Ans:- Duties and responsibilities of safety officer are :-

Ans from Ques 6-a

Some proactive measure to enhance safety awareness and compliant on-board as a safety officer are as follows:-

- 1) Conduct safety drills regularly.
- 2) Conduct safety meeting regularly with crew representatives.
- 3) Provide safety briefings to new joined personnel and to visitors.
- 4) Carry out tool box meeting prior starting of any job.
- 5) Carry out risk assessment prior starting of any job.

- 6) Carry out routine safety inspection of work area, equipment & PPE prior starting any job.
- 7) Carry out safety inspections atleast once every <sup>three</sup> month covering all parts of the vessel.
- 8) Ensure Permit to work system are in compliance.
- 9) Ensure safety posters, signs and procedures are pasted in common areas.
- 10) Ensure housekeeping is adequate to prevent slips, trips and falls.
- 11) Identify hazards early and recommend corrective and preventive actions.
- 12) Promote "SAFETY FIRST" & "NEAR MISS REPORTING" culture on-board.

Ques 7) Draw up a checklist for conducting routine safety inspection onboard related to personnel health & safety by safety officer (6 times)

Ans:- Name of vessel: \_\_\_\_\_ Date: \_\_\_\_\_

#### A) Access and safe movement

- Are means of access on-board in a safe condition, well lit & unobstructed?
- Are all gears on-board safely secured against heavy rolling pitching and in an appropriate place?
- Are all guard rails/chains/ropes in place, secure and in good condition?
- Are all openings through which a person could fall, suitably fenced?
- If and when portable ladders are in use, are they properly secured and at a safe angle?

#### B) Environment

- Are areas where a person has to work safe to enter?
- Has the required checklist been filled and precautions been taken before entering enclosed spaces?
- Are lighting levels adequate?
- Is ventilation adequate?
- Are the decks, E/R, other work spaces and accommodation clear of rubbish, combustible material, spilled oil etc.

#### C) Working conditions

- Are necessary safe operating instructions clearly displayed?
- Are necessary safety signs clearly displayed?
- Are permit-to-work and hot-work checklists used where necessary?

- Are crew member wearing necessary protective clothing and equipment?
- Is that protective clothing and equipment in good condition and being correctly used?

#### D) Miscellaneous.

- Are all statutory regulations and company safety procedures being complied with?
- Is the safety advice in publications such as code of safe working practices for Merchant Seaman, M-notices, SMS manual etc. being followed where possible?
- Have any faults identified in previous safety meeting been rectified?
- Have the officer/rating any safety suggestions to make?
- Is the level of supervision adequate particularly for inexperienced crew?

Areas Inspected:

Remarks/ Observation:

Safety officer

Master

## SAFETY COMMITTEE

Ques 8) Explain the role of safety committee on-board the ship. (2 times)

Ans:- The role of safety committee on-board ship are to:

- Safety committee is a safety forum on-board which will make all efforts to create a safe and healthy working environment on-board.
- Conduct safety meeting.
- Assist safety officer to investigate accidents and near miss/hazardous occurrences to prevent recurrence.
- Identify early & rectify any safety, health and environmental protection related shortcomings in the ship or her equipment
- Ensure implementation of corrective/preventive action on non-conformities/deficiencies.
- Ensure company safety policies and procedures are effectively followed.
- Encourages and promote safety culture.
- Recommend corrective measures for unsafe and unhygienic practices.
- Review effectiveness of drills.
- Review records of rest hours.

Ques 9) In Monthly Safety Committee meeting, describe the various agenda items to be discussed (3 times)

Ans:- The following points will form the agenda of the Monthly Safety Committee meetings:

- To read and approve the minutes of last meeting.
- Follow up actions arising from previous meetings.
- Findings of inspections of work places with a view to eradicate unsafe, unhygienic practices and propose corrective measures
- Investigation of causes of accidents, near miss/hazardous occurrences and unsafe practices and propose preventive action to be taken.
- Action taken or required to be taken for bringing consciousness among ship staff regarding safety, health and environmental protection.
- Risk assessments undertaken.
- Deviation from rest hours, if any.
- Suggestion received from ship staff to improve safety, occupational health and environmental protection standard and awareness on-board.
- Discussion of fleet circulars issued by the Company.
- Discussion of information received from the company regarding the accidents/incidents occurred within the industry.

### CODE OF SAFE WORKING PRACTICES

Ques 10) Explain the purpose and objectives of "Code of Safe working practices".

Ans:- Purpose of COSWP are:

- To improve health and safety on-board ship.
- To prevent accidents, injuries and occupational illnesses onboard ships.
- To provide guidance on safe working practices for many situations that commonly arise on ship.
- To provide basic principles that can be applied to many other work situations that are not specifically covered.
- To provide guidance as to how the statutory obligations should be fulfilled. However, the guidance should never be regarded as superseding or amending regulations.
- To support implementation of safety management system in line with the ISM code.

Objectives of COSWP are:-

- Identify on-board hazards and risks in different shipboard operations.
- Provide guidance on risk assessment procedures.
- Establish safe system of work for routine and non-routine tasks.
- Define responsibilities of employers, masters, officers and crew regarding safety.
- Encourage reporting and investigation of accidents and near miss/hazardous occurrences.
- Ensure proper use of personal protective equipment (PPE).
- Promote training and supervision to maintain a safe working environment.

Ques 11) List the items covered during the Chief officer's weekly safety inspection of ship as prescribed in code of safe working practices. (3 times)

Ans:- As prescribed in COSWP, CH 13: Safety officials  
 Annex 13.1 Checklist for safety officer's inspection  
 Answer same as Ques 7

Ques 12) As per code of safe working practices for merchant seaman, explain the care and maintenance required for ropes and wires? (2 times)

Ans:- As per COSWP, following care is required for ropes and wires :-

- Ropes and wires shall be properly stored away from direct sunlight, heat, extreme cold, precipitation and wet deck.
- Ropes and wires shall be properly stored away from containers of chemicals, detergents, paints, rust removers and other substances capable of damaging them.
- Cover mooring ropes with tarpaulins, or, if the ship is on a long voyage, stow them below deck.
- Surging of rope or slack away by rendering should be avoided.
- Sharp angles in the lead of the rope between the fairleads and the mooring bollard on the wharf shall be avoided.
- Winch drum ends, mooring rollers, bollards and panama leads shall be (kept) free for turning and should be free from damage/rust on the surface, which could cause rope wear.
- Do not apply too many turns on the winch drum when heaving a line. Generally four turns shall be taken.

- Never knot mooring ropes as knots weaken a rope, even after they are removed.
- The record of inspection, hours in use and replacement of mooring ropes and wires shall be maintained.
- Certificates for ropes and wires are annotated with dates and specific winches to which they are fitted.

As per COSWP, following maintenance is required for ropes and wires:-

- 1) Mooring ropes & wires should be periodically inspected along their entire length atleast once a month.
- 2) The wear along the length shall be closely checked to assess the integrity of the ropes and wires.
- 3) The strands of the rope shall be opened up for checking internal wear.
- 4) Eye splice integrity shall be checked.
- 5) Defects such as bird caging, kinking, corrosion and flattening should be examined for discarding the mooring ropes/wires.
- 6) Wash with fresh water to remove dirt, salt and other corrosive substance.
- 7) Apply wire rope lubricant every month on the surface of wire rope to reduce friction and prevent corrosion.
- 8) Replace damaged or worn-out ropes and wire immediately.

Ques 13-a) What is the purpose of the "work permit"? What are the contents of work permit?

Ans:- Purpose of work permit:-

- To identify the hazards and ensure they are eliminated or effectively controlled.
- To specify control measures based on the hazards and findings identified in the risk assessment.
- To ensure that you will follow the necessary control measures to do the work safely.

Contents of work permit:

- Location of the work to be done.
- Details of the work to be done.
- Nature of any preparatory tests undertaken and its results.

- Measures undertaken to make the job safe.
- Safeguards to take during the operation.
- Period of validity of the permit to work (should not exceed 24 hours)
- Signature of Authorized officer and competent person.

b) As per COSWP, what precautions will you take while working aloft?

Ans:- As per COSWP, precautions required to take while working aloft are as follows:-

- Carry out risk assessments before working aloft.
  - Carry out tool box meeting.
  - Fill and complete working aloft permit.
  - Inform Duty officer/duty engineer.
  - Follow Lockout/Tagout procedure, if required.
  - Identify on-deck supervisor for working aloft.
  - Use proper PPE.
  - All tools to be raised and lowered secured on a lanyard/belt or bag.
  - Use a stage, ladder, scaffolding, bosun's chair or secured scaffold tower when working beyond normal reach.
- 10 • Personnel working at height where there is a risk of falling should wear a safety harness with a lifeline or other arresting device at all times.
- Safety net should be rigged where necessary and appropriate.
  - Avoid working from ladders as possible. Use them only for low-risk, short-duration work.

c) Prepare a checklist for enclosed space entry and explain importance of same?

Ans:- Checklist for enclosed space entry:

- 1) Has the space been segregated by blanking off or isolating all connecting pipelines?
- 2) Have valves on all pipelines serving the space been secured to prevent their accidental opening?
- 3) Has the space been thoroughly ventilated?
- 4) Has the pre-entry atmosphere tests been carried out?
- 5) Have arrangements been made for frequent atmosphere checks while the space is occupied and after work breaks?

- 6) Have arrangements been made for continuous ventilation while the space is occupied and during work breaks?
- 7) Is the access adequate?
- 8) Is adequate illumination provided?
- 9) Is rescue and resuscitation equipment available for immediate use at the entrance of the space?
- 10) Has responsible person been designated to stand by at the entrance of the space?
- 11) Has the officer of the watch been advised of the planned entry?
- 12) Has method & frequency of communication between the person at the entrance and those entering the space been agreed and tested?
- 13) Are emergency and evacuation procedures established and understood by all personnel involved with?
- 14) Is all equipment used in good working condition and inspected prior to entry?
- 15) Are personnel properly clothed and equipped?

Importance of enclosed space entry permit :  
 Same as 13-a: Purpose of work permit.

## DOCK SAFETY REGULATION

Ques 14) With respect to Dock Labour regulations, write a short note on :

(i) Responsible Person & Competent Person (3 times)

Ans:-

- Authorized person means a person authorised by the employer, the master of the ship or a responsible person to undertake a specific task which hold necessary technical knowledge and experience for undertaking the task.

- Responsible person means a person appointed by the employer, the master of the ship, the owner of the gear or port authorities to be responsible for the performance of a specific duties for which he/she has sufficient knowledge and experience.

• Competent person means:

- a person in India who is approved by the Chief inspector for the purpose of testing, examination or annealing and certification of lifting appliances, loose gears or wire ropes.
- any other person who is recognized as competent for issuing certificates in other countries under the relevant regulations in force adopted by International Labour Conference.

(ii) Test and Periodical examination of lifting appliances (3 times)

- Ans:-
- (1) Before being taken into use for the first time or after it has undergone any major repairs and also once atleast in every five years, all lifting appliances including all parts and gears, wheather fixed or moveable, shall be tested and examined by a competent person.
  - (2) All lifting appliances shall be thoroughly examined by a competent person once atleast in every 12 months.
  - (3) Thorough examination for the purpose of this regulation shall mean a visual examination, supplemented if necessary by other means such as hammer test, carried out as carefully as the condition permit, in order to arrive at a reliable conclusion on the safety of the parts examined; and if necessary for this purpose, parts of the lifting appliances and gear, shall be dismantled.

Ques 15) As per dock worker regulations. What are powers of dock inspector?

Ans:- An inspector may at any port for which he is appointed:

- (i) enter any ship, dock, warehouse or other premises where any dock work is being carried on.
- (ii) make examination of the ship, dock, lifting appliance, loose gear, lifting device, staging, transport equipment, warehouse or other premises, used or to be used, for any dock work.
- (iii) examine document related to the employment of dock workers.
- (iv) take evidence of any person on the spot which he may consider necessary.
- (v) take copies of registers, records or other document as he may consider relevant for the purpose of inquiry.
- (vi) take photograph, sketch, sample, weight measures or record as he may

- consider necessary for the purpose of any examination or inquiry.
- (vii) hold an inquiry in case of any accident or dangerous occurrence which he has reason to believe has caused due to the failure of any lifting appliances, loose gear, transport equipment, staging etc.
- (viii) issue show cause notice relating to the safety, health and welfare provisions, arising under the Act or the regulations
- (ix) prosecute, conduct or defend before any court, any complaint or other proceedings, arising under the Act or the regulations.
- (x) direct the port authority, dock labour board and other employers of dock workers for getting the dock workers medically examined if considered necessary.

## REPORTING OF ACCIDENTS

Ques 16) Describe the procedure available on-board ship for reporting of accidents (2-times)

- Ans:-
- Use company provided forms or software program for reporting accidents ensuring the following:
    - (i) Complete all listed field using appropriate codes.
    - (ii) Clearly identify immediate and basic causes of accident.
    - (iii) Recommend preventive and corrective actions.
    - (iv) Highlight any breach of regulations or company safety procedures.
    - (v) Photographs are important for accident analysis - where possible, forward photographs with the reports.
  - Wherever immediate assistance, the company should be informed immediately.
  - Master shall instruct head of each department to submit report on accidents and hazardous occurrences taken place in their respective departments as when it occurs.
  - As soon as possible, complete the analysis within 5 days of incident and forward the report.
  - The accident report shall contain atleast the following:
    - (i) Date & time of event.
    - (ii) Position of event.

- (iii) Nature of accident
- (iv) Nature of damage
- (v) Operation during event
- (vi) Extent of damage
- (vii) Brief description of accident
- (viii) Personnel injury, if any.
- (ix) Investigation & RCA
- (x) Preventive/Corrective action needed.

Ques 17) During cargo operations, one of the stevedore's men gets injured while working on-board, how will you deal with this situation?

- Ans:-
- Stop cargo operation immediately (at least in that hold/area)
  - Raise alarm & inform Master.
  - Shift casualty using ship's stretcher safely.
  - Provide first aid.
  - Request medical assistance via agent/port control.
  - Inform all the relevant authorities/concerned parties.
  - Take photographs for evidence and investigation.
  - Fill accident/incident report form.
  - Carry out investigation & find out RCA.
  - Review risk assessment and reinforce safety procedures.

Ques 18-a) Prepare a contingency plan for piracy?

- Ans:- Prior entering piracy affected areas, the following precautions must be taken:
- Comply with BMP5 as applicable.
  - Post extra lookouts on bridge.
  - Keep two radars on and watch for small unlighted crafts moving nearby.
  - Keep deck water running and hoses rigged.
  - Keep all the accommodation doors locked from inside except one.
  - Establish a pre-determined signal, in case of pirate attack, to warn the crew.
  - Carry out a drill and determine the citadel in case pirates board.
  - Brief the crew member about action to be taken when pirates board the ship.

• If an unlighted craft is seen approaching the vessel, following shall be done:

- (i) Alert all the crew members.
- (ii) Sound whistle continuously to warn off the craft.
- (iii) Flash light/searchlight at the craft.
- (iv) Warns the ships/shore in the vicinity about the presence of suspicious crafts and their description.
- (v) Try altering course zigzag way to make boarding difficult.
- (vi) Increase speed if possible.

• In case of pirate boarding the vessel, do the following:

- (i) Raise pre-determined alarm
- (ii) Activate SSAs
- (iii) Warn the shore/ships in the vicinity.
- (iv) ASK crew members to retreat to places decided earlier.
- (v) Give in to their demands
- (vi) Do not provoke them to resort to violence

(b) Describe the Best Management Practices (BMP) to be followed to deter piracy.

Ans:- The best management practices (BMP) to be followed to deter piracy are as follows:-

- (i) Understanding the threat
  - Obtaining current threat information.
  - Review guidance.
- (ii) Assess the risk
  - Conduct risk assessments.
  - Identify ship protection measures.
- (iii) Implement ship protection measures
  - Test critical equipment
  - Brief and train the crew.
  - Extra lookout/radar watch
  - Control access.
  - Follow flag state and military guidance.

(iv) Report

- Report to UKMTO
- Register with MSCHOA
- Report incidents.
- Report suspicious activity.
- Send distress signal when attacked.

(v) Cooperate

- Cooperate with other shipping and military forces.
- Cooperate with law enforcement to preserve evidence.

(c) What are the reporting requirements for transiting piracy areas?

Ans:- The reporting requirements for transiting piracy areas are as follows:-

- UKMTO acts as the primary point of contact for merchant ships and their CSOs, providing liaison with military forces in the region.
- UKMTO administers the voluntary Reporting scheme, under which merchant ships are encouraged to send regular reports.
- These include :
  - 1) Initial reports.
  - 2) Daily reports.
  - 3) Final reports.
  - 4) Reports of suspicious/irregular activity.
- UKMTO is able to communicate with ships and CSOs directly, in order to circulate warnings and advisories of incidents within the region.

(d) List the actions required in sequence during ship search drills?

- Ans:-
- Drill scenario : AB on general round on deck at anchorage found one box with explosive symbol in the forward boson store.
  - Duty officer informed immediately.
  - Inform Master on the bridge.
  - General emergency alarm raised and announcement made on P.A system.
  - All crew reported to the muster station except Master, duty officer, duty AB, duty engineer & duty oiler.
  - DPA informed, port control informed and urgency message sent (Simulated)

- 7
- PPE of all crew member checked & found in good order.
  - Nature of emergency and duties of each crew member explained.
  - Master ordered to check for rest spaces on the vessel to search for any other unauthorized box/explosive.
- 10
- All team commence searches.
  - Search completed no other unauthorized box found on-board, all areas are clear and same reported to the master.
  - Vessel awaiting coast guard assistance.
  - Security level and duties explained.
  - Debriefing carried out.
- 15
- Drill completed.

### Q. 3. Competence no. 17.7 (SHIP MAINTENANCE AND REPAIRS)

(Page No 71 to 91)

**SHIP MAINTENANCE AND REPAIRS**

KEEPING SHIPS STRONG. ENSURING SAFE VOYAGES.

- EXPERT MAINTENANCE
- TIMELY REPAIRS
- SAFE OPERATIONS
- COST EFFECTIVE
- 24/7 SUPPORT

PREVENTIVE MAINTENANCE  
Plan - Inspect - Prevent

PERFORMANCE & RELIABILITY  
Maximum Efficiency

REPAIRS & SERVICING  
Expert Solutions

SYSTEMS & EQUIPMENT  
Keep in Top Condition

SAFETY COMPLIANCE  
Standards - Quality - Care

WELL MAINTAINED TODAY,  
READY FOR TOMORROW.

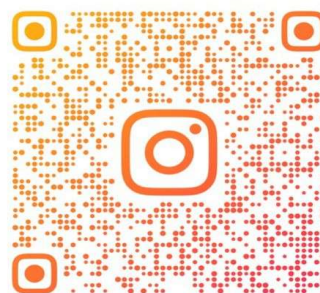
SAFETY RELIABILITY EFFICIENCY

Notes by: Anupam Singh Rajput  
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### Q.3. Competence no. 17.7 (Ship maintenance and repairs)

#### CORROSION PREVENTION

Ques 1) How corrosion prevention is important to ensure safety of life and marine environment? (5 times)

Ans:- Corrosion can weaken the ship's structure and its equipment, leading to potential hazards that threaten both the safety of life and the marine environment. Hence the corrosion prevention is important for:

#### SAFETY OF LIFE

- Prevention of structural failure: Corrosion reduces the thickness and strength of hull plates, decks, bulkheads and pipelines. This can cause structural failure, flooding, or even loss of the vessel, putting crew lives at risk.
- Prevention of machinery and equipment failure: Corrosion in engines, steering gear, crane, mooring winches, firefighting systems and safety equipment can lead to accident or equipment malfunction during critical operation. That endangers the safety of life and vessel.
- Prevention of accidents or hazardous occurrences: Corroded ladders, handrails, walkways and lifting equipment poses the risk of slips, falls and injuries on-board. Thereby increasing risks to human safety on-board.

#### SAFETY OF MARINE ENVIRONMENT

- Pollution prevention: Corroded cargo tanks, bunker tanks and pipelines may develop leak or ruptures, causing oil or chemical spills. This can have catastrophic effects on marine life and ecosystems. This also violates MARPOL regulations.
- Marine Habitat protection: Structural failures of offshore rigs or ships can release debris and contaminants, harming marine biodiversity.
- Sustainability: Preventing corrosion extends the lifespan of vessels and reduces the need for frequent replacements, lowering the environmental footprint of shipbuilding and scrapping.
- Costly Repairs and Downtime: Extensive corrosion can result in expensive repairs and significant operational downtime. If a ship is out for service for repairs due to corrosion, it hamper operation of ship and owner have to suffer financial losses.

Ques 2) What are the parts of ship's hull most liable for corrosion and how you counteract this from getting corroded. (4-times)

Ans:- The parts of ship's hull most liable for corrosion and counter action to prevent from getting corroded are as follows:-

(i) Waterline Area

- Areas just above and below the waterline are alternately exposed to air and seawater, which accelerates corrosion due to continuous wetting and drying.
- Counter action: Use anti-corrosion paints. Use of sacrificial anodes or Impressed current cathodic protection (ICCP) to protect against corrosion.

(ii) Bilge areas

- Bilge areas can accumulate water and contaminants, which accelerates corrosion of structural components.
- Counter action: Apply anti-corrosive coatings on bilge surfaces. Regular pumping and cleaning of bilge areas to remove water and contaminants.

(iii) Ballast tanks

- Ballast tanks are often filled with seawater and hence become most liable for corrosion.
- Counter action: Use anti-corrosion paints for coating the interior surface of ballast tanks. Regular inspection and maintenance to detect and timely repair any corrosion damage.

(iv) Tank tops and tank bulkheads

- Tank tops and bulkheads in cargo tank and ballast tanks are exposed to corrosive cargo residue and ballast water.
- Counter action: Thorough cleaning and coating of tank surfaces after cargo operation. Regular inspection and maintenance to detect and timely repair any corrosion damage.

(v) Seachest and strainers

- Seachest and strainers provide intake openings for seawater systems, making them liable to corrosion.
- Counter action: Installation of corrosion resistant materials for seachest and strainers. Routine cleaning and maintenance to prevent corrosion buildup.

## (vi) Propeller and shaft

- Propeller and shafts are exposed to seawater which can cause galvanic corrosion due to dissimilar metals.
- Counter action: Use of sacrificial anodes or Impressed current cathodic protection (ICCP) to protect against corrosion. Regular inspection and maintenance of propeller and shafts.

## (vii) Welded joints and structural connections

- Welded joints and structural connections are more liable to corrosion due to small crack and trapped moisture.
- Counter action: Use anti-corrosion paints on welded joints and connections. Regular inspection and maintenance of welded joints to ensure integrity and detect corrosion.

Ques 3) Fore peak water ballast tank is showing signs of corrosion. How would you treat it? (3 times)

- Ans:
- 1) Inspection: Carry out a thorough visual inspection to assess extent of corrosion and condition of existing coating.
  - 2) Surface preparation: Remove rust, scale, and salt deposits by chipping, grit blasting or hydro-blasting.
  - 3) Repair of damaged steel (if require): If steel loss exceeds allowable limits, crop and renew the affected plating.
  - 4) Priming: Apply a suitable primer specifically formulated for marine environment to the prepared tank surface.
  - 5) Protective coatings: Apply marine-grade epoxy coating specifically designed for ballast tanks.
  - 6) Multiple coats: Apply multiple coats (primer + intermediate + topcoat) of paint as necessary to achieve the desired thickness and coverage. Allow sufficient drying time between coats as per manufacturer's instruction.
  - 7) Cathodic protection: Install or renew sacrificial anodes (zinc/aluminium) inside the tank.
  - 8) Documentation: Maintain detailed records of the corrosion treatment process, including surface preparation, primer and paint application, and any additional protective measures implemented.

## STRUCTURE OF PAINTS AND PAINTING AREAS

Ques 4) Prepare a painting scheme for cargo and other pipelines on main deck. (4-times)

Ans:- Following are common painting scheme for cargo and other pipelines (fittings) on main deck :-

- 1) Location: Cargo and other pipelines on main deck.
- 2) Cleaning method: Chemical cleaning and FW wash.
- 3) Blasting method: Hydro blasting
- 4) Surface preparation scale: SA 2-5
- 5) Paint application method: Airless spray.
- 6) Primer: Epoxy 2 coats.
- 7) Top coat: Polyurethane 2 coats.
- 8) Final DFT (Dry Film Thickness): 75-100  $\mu\text{m}$ .

Ques 5) What precaution would you take before and while painting steel deck plates? (3-times)

Ans:- Precautions before painting

(i) Surface preparation

- Remove oil, grease, salt and dirt with solvents or fresh water washing.
- Carry out mechanical cleaning or grit blasting to SA 2.5 standard.
- Smooth sharp edges, weld spatter and rough spots to prevent coating failure.

(ii) Environmental checks.

- Ensure steel temperature is at least 3°C above the dew point to avoid condensation.
- Avoid painting in rain, fog or when relative humidity exceeds 85%.
- Confirm good ventilation if working in enclosed space.

(iii) Safety measures.

- Workers must wear PPE: gloves, goggles, respirators and protective clothing.
- Keep fire safety in mind when using solvent-based paint (no open flames nearby)

## Precautions while painting

### (i) Application control

- Apply paint in thin, even coats to prevent sagging or blistering.
- Follow manufacturer's recommended dry film thickness (DFT) for each coat.
- Use correct tools (Airless spray for large areas, brushes/rollers for detail work)

### (ii) Stripe coating.

- Apply extra paint at edges, welds, corners and around fitting, where corrosion usually starts.

### (iii) Drying and curing.

- Allow proper drying time between coats.
- Recoating too soon can trap solvents and cause blistering.
- Protect freshly painted surfaces from dust, rain or mechanical damage until fully cured.

### (iv) Quality checks.

- Measure coating thickness with a DFT gauge.
- Inspect visually for pinholes, missed spots or uneven coverage.

## PLANNED MAINTENANCE

Ques 6-a) What is the planned maintenance system? What are the advantages and disadvantages of computer-based PMS over conventional maintenance scheme? (6-times)

Ans:- Planned maintenance system

- A planned maintenance system allows shipowner and operators to plan, perform and document vessel maintenance at intervals complying with class and manufacturer requirements.
- The objective is to ensure safe and reliable operations of vessels and it's equipment.
- A planned maintenance system on ships is mandatory under the ISM code.
- In PMS, a systematic approach to maintenance begins with the establishment of a complete database of machinery, equipment and fittings.
- It prevent breakdowns by scheduling timely maintenance.
- It extend life of machinery & equipment.
- PMS maintain proper record for audits, inspections & surveys like ISM audit, PSC, class etc
- It ensures compliance with class, flag state and company's requirements.

### Advantage of Computer-based PMS over conventional maintenance scheme

- 1) **Better planning and scheduling:** It defines and schedule calendar-based and condition based tasks. Computer based PMS generates automatic reminders for due jobs, that means, less chance of missing maintenance schedule.
- 2) **Accurate record keeping:** Computer based PMS stores maintenance history digitally, that makes it easy to retrieve during audits or inspections.
- 3) **Integration:** Computer based PMS get linked with spare part inventory, crew job assignments and procurement system that ensures parts are available when maintenance is due.
- 4) **Save time and effort:** Computer-based PMS does not need any manual calculations or paperwork that helps in faster reporting and documentation.
- 5) **Improved reliability of equipment:** Computer based PMS helps in timely maintenance that reduces breakdown of equipment and ensures safe and smooth operation of ship.
- 6) **Transparency & Accountability:** Computer based PMS shows digital logs of who performed the task and when.

Some other advantages are:-

- Categorize jobs according to relevant criteria, such as critical, safety relevant, class relevant etc.
- Automatically update inventory based on the spare parts consumed during maintenance.
- Maintain life cycle records of each equipment.
- Defect management.
- Have central task lists for on-board staff and office technical task.

### Disadvantage of computer based PMS over conventional maintenance scheme

- 1) **Initial cost:** Software purchase, installation and training is required for computer-based PMS.
- 2) **Training requirement:** Crew must be trained to use the system properly.
- 3) **Dependence on technology:** Computer-based PMS requires reliable hardware, software and sometimes internet connectivity. System failures or cyber attacks could disrupt maintenance planning.
- 4) **Over reliance:** Crew may depend too much on software and ignore practical judgment.
- 5) **Risk of data errors:** Wrong data will produce wrong maintenance schedule.

6.b) Is it mandatory to have PMS and under which regulation/convention? Can your ship be detained by PSC inspector in absence of a PMS on-board? (3 times)

Ans:- Yes, a Planned maintenance system is mandatory for ships to ensure safety and environmental compliance. It is made mandatory by the ISM code (Part A, section 10), developed by the IMO.

Yes, a ship can be detained by a Port State Control (PSC) inspector if there is no effective Planned Maintenance System (PMS) on-board.

Ques 7.a) How planned maintenance system helps in achieving the safety of the crew on-board the ship? (5 times)

Ans:- Write same as Ques 6.a) Advantages of computer based PMS

Few more points are:

7) Prevents machinery failures

- Regular servicing of engines, pumps, winches and steering gear reduces the chance of breakdowns during critical operations.
- Prevent accidents like loss of propulsion or steering, which could endanger the safety of crew.

8) Ensures safety equipment readiness

- The PMS plans and ensures regular inspections of lifeboats, fire extinguishers, emergency lighting, alarm systems etc.
- Hence, the equipment is ready and safe to be used during emergencies, thus, reducing risk to life.

9) Reduce Hazardous situations

- The PMS plans and ensure proper maintenance of cargo pipelines, ballast systems and deck machinery.
- This prevents leaks, spill and mechanical failure, thus, reducing risk to life and marine environment

10) Supports regulatory compliance

- PMS ensures compliance with the ISM code and classification society rules.
- Crew safety is indirectly protected because the vessel meets international standards for safe operation.

7-b) How does Planned Maintenance system (PMS) serve to reduce cost and increase reliability of hum, machinery and equipment? (2 times)

Ans:- Write same as Ques 6 a) Advantages of computer based PMS  
 Write same as Ques 7 a) <sup>+</sup> Few more points.

Ques 8) Write short notes on:

(i) Preventive maintenance (5 times)

- Ans:-
- Preventive maintenance is the proactive maintenance of machineries and equipment done through regular cleaning, lubrication, inspection and parts replacements.
  - It is conducted at pre-determined intervals (calendar-based or running hours) to prevent equipment failure before it occurs.
  - It reduces the chance of equipment breakdown.
  - It extends machinery lifespan.
  - Examples: Overhauling a main engine air cooler after 4000 hours, greasing bearing, changing lube oil filter and calibrating sensors.

Types of preventive maintenance

a) Usage based maintenance: Usage-based maintenance is scheduled based on how much a machinery and equipment are used, rather than on a fixed time schedule.

b) Time based maintenance: Time-based maintenance is scheduled by time interval recommended by manufacturer. It includes completing maintenance task at regular interval, whether that be weekly, monthly, quarterly or annually, regardless of the condition of the machinery or equipment.

c) Condition-based maintenance: Condition-based maintenance is monitoring the real-time condition of machinery or equipment through sensors, inspections and performance data to determine when maintenance is required. Maintenance is only performed when the equipment shows signs of deteriorating performance or potential failure.

d) Predictive maintenance: Predictive maintenance uses data analytics to predict when equipment is likely to fail. This method relies on historical data and trends to forecast maintenance needs.

e) Prescriptive maintenance: Prescriptive maintenance is an evolution of predictive maintenance that not only predict when failure will occur but also suggests the most effective course of action to prevent them.

(ii) Incidental maintenance. (5-times)

- Incidental maintenance is the maintenance carried out when a defect or damage is noticed during operation or inspection, or, maintenance task triggered unexpectedly due to breakdowns.
- It is not scheduled/ previously planned, but carried out when the need arises.
- It prevents small issues from developing into major failures
- It cannot replace systematic preventive maintenance.
- Example: Repairing a sudden fuel pipe leakage, Replacing a worn gasket during routine checks.

Ques 9 a) As a chief officer, prepare a plan to implement PMS on-board a newly build yard deliver vessel. (3-times)

(OR),

As a chief officer, explain how would you assist in preparing and implementing a planned maintenance system for a new building ship, which is in her final stage of delivery? (2-times)

Ans:- Step 1: Choose and install a software platform

- Select a software platform that includes all the appropriate features required.

Step 2: Get your data together.

- List all machinery, deck fittings, safety equipment and hull structures.
- Collect manuals & maker's recommendations: Use yard-delivered documents to set maintenance intervals.

Step 3: Scheduling & Planning

- Construct the database based on the manufacturer's recommendation.
- Input inspection procedures and frequency of each equipment.
- Inventory of each equipment and it's spare to be entered in PMS.
- Each item gets a task sheet with frequency, method and responsible officers.
- Schedule & plan the weekly tasks, monthly tasks, Quarterly tasks, Annual tasks and Dry-docking tasks.

Step 4: Input data into PMS software

- Enter Equipment details, maintenance schedules and spare part information
- Classify as: Usage based or Time-based.
- Allocate jobs to: Deck officers, Engineers.
- Clearly define: who performs, who verifies.

Step 5: Implementation & Monitoring.

- Assign unique login Id & password to each person who is part of the PMS.
- Train crew on PMS procedures and software use.
- Emphasize safety precautions during maintenance (Lock-out/tag out, PPE, confined space entry)
- Chief officer verifies records weekly ; Master reviews monthly.
- Conduct internal audits as per ISM code and prepare for class approval of software.

9.6) List out the documents and data you will use in preparing PMS of a ship.

Ans:- The documents and data required while preparing PMS of a ship are as follows:-

- 1) Maker's manual
- 2) Ship's drawing and plans
- 3) Equipment list/spare inventory.
- 4) Spare part catalogues.
- 5) Statutory and Regulatory maintenance requirements.
- 6) Classification society requirements.
- 7) Company SMS (Safety Management System)
- 8) Previous maintenance records (if available)
- 9) Operational (Machinery running hours) data.
- 10) Survey/inspection report (for condition-based maintenance planning)

Ques 10) What are the factors, which need to be considered while deciding upon the interval between two inspections or schedule of maintenance of an item in the Planned Maintenance System?

Ans:- The factors needs to be considered while deciding upon interval between two inspection or schedule of maintenance of an item in the Planned

maintenance system are as follows:

- 1) Maker's recommendations
- 2) Running Hours/usage
- 3) Operating environmental conditions.
- 4) Criticality of equipment.
- 5) Past performance & experience.
- 6) Condition monitoring results.
- 7) Statutory and class requirements.
- 8) Availability of spares & resources.
- 9) Cost-benefit consideration.
- 10) Age and condition of equipment.

Ques 11-a) Prepare a maintenance schedule of hydraulic hatch covers. (5 times)

Ans:- While maintenance, follow standard company PPE procedure and Lock out/Tag out procedure, as well as manufacturer's safety precaution.

After each cargo operation PMS

- Clean the coaming tops and remove any debris or equipment.
- Check and clean the surface of the seals.
- Clear drain line holes and valves.
- Drain valve caps should be attached by chain, but not screwed on. They must be ready in case of fire in the hold or when carrying out fumigation.
- Grooves and worn landing pads can be built up with welding, as required, giving a permanent repair.
- Check hydraulic system for leaks, especially coupling, valve blocks and flexible hoses.

Monthly PMS

- Inspect, lubricate and grease rotating parts, sliding parts & screw.
- Check alignment with coaming to ensure proper seating.
- Check hydraulic pump for any leakage or vibration.
- Check gaskets and seals for deformation or cracks.
- Confirm emergency manual operation system is functional.

Quarterly PMS

- Check sealing arrangement for condition and permanent deformation.

- Check clamping device and condition of rubber components.
- Check hinge pins for wear and repair as necessary.
- Check for visible corrosion, cracks or deformation.
- Grease wheel spindles, cleats, hinge pins and hydraulic cylinders.

#### Annual PMS

- Complete inspection of steel-to-steel contact points, corrosion and structure.
- Check quantity and condition of spares carried on-board.
- Change hydraulic oil filters.
- Check hydraulic system oil by analysis.
- Check safety locking devices and hydraulic system cutouts.

Ques 11b) Prepare a planned maintenance schedule for cargo handling crane (3 times)

Ans:- While maintenance, follow standard company PPE procedure and Lock out/Tag out procedure, as well as manufacturer's safety precaution.

#### Monthly PMS

- Inspect, lubricate and grease rotating parts.
- Check oil filter/clean as required.
- Check any abnormal/vibration during operation.
- Check proper functioning of brakes.
- Carry out visual inspection for oil leaks.
- Carry out general inspection of lifting hook, safety latch & wire rope.
- Safety devices such as limit switches, cut outs and alarms shall be tried out.

#### Quarterly PMS

- Check the function test of all limit switches as installed on the crane-hoisting, luffing and slewing.
- Check insulation of electric motor.
- Check all bolts and nuts are tightened.
- Inspect the fastening bolts for looseness by hammering.
- Inspect the hoisting and luffing winches.
- Ensure wire rope fixed bolts are intact.

#### Six monthly PMS

In addition to monthly and 3 monthly checks, carry out the below also:

- Collect LO sample & land for lab analysis

- Carry out rocking test as per maker manual and record the readings.
- Check visual condition of wires, hooks, stays.
- Carry out emergency operation test as per maker manual.
- Check condition of hoses/connectors

#### Annual PMS

- All cargo gears to be inspected annually by a competent person or by class surveyor.

#### Five Yearly PMS

- Load test shall be carried out and record shall be maintained.
- Wire ropes of Hoist handling crane must be renewed at the interval of a period not exceeding 60 months.

Ques 11-c) Prepare PMS scheduled for mooring winches on your ship?

Ans:- While maintenance, follow standard company PPE procedure and lock out/tag out procedure, as well as manufacturer's safety precaution.

#### Monthly PMS

- The winches shall be lubricated at least once a month.
- All bearings and other points covered under lubrication schedule shall be greased.
- Lubricate the pin and threaded parts of the brake rod.
- Lubricate the pinion and wheel gears with gear oil.
- Check oil level in gear case as well as condition of gears.

#### Quarterly PMS

- Grease all lubrication nipples.
- Check brake lining, renew if required.
- Check brake band stoppers are in place and adjust the clearance.
- Check all bolts and nuts for proper tightness.
- Open the drain screw on each mooring drum and drain for water.

#### Annual PMS

- Check overall condition of winch foundation and structure
- Check the end stopper
- Check the hydraulic valves are correctly adjusted.
- Gear case oil to be renewed
- Mooring winches brake holding and rendering tests shall be carried out annually by ship staff or competent workshop and document retained.

Five Yearly PMS

- Open and check all windlass mooring winches bearing
- Claw coupling shall be machined as necessary.

11. d) Draw out a planned maintenance and inspection schedule for lifeboats, davits and winches

(OR),

Prepare a planned maintenance routine for the totally enclosed lifeboat and the associated gravity davit, covering weekly, monthly, quarterly, annual and 5 yearly maintenance, inspections and tests.

(OR),

Prepare a PMS for your rescue boat.

Ans:- While maintenance, follow standard company PPE procedure and lock out/tag out procedure, as well as manufacturer's safety precaution.

Weekly PMS

- All lifeboat shall be moved from their stowed position to the extent necessary to demonstrate satisfactory operation of the launching appliances. This shall be done without any person on-board the lifeboat.
- Check the fuel quantity.
- Check the lubricating oil level in the engine, as well as, in the gear box.
- Grease the stuffing boxes on the propeller shaft tube fore and aft.
- Check the forward and aft grips are tight, and the safety pins are in place.
- Check that the power supply to the battery charger is on and the battery switch is off.
- Check that the emergency lights are working.
- Check that the skates in position and securing straps of them in good condition.
- Check that the toggle painter is rigged and secured.
- Check that oars, boathooks and loose gear are in good condition.
- Inspection/maintenance of the on-load release and water spray system shall be carried out.
- Clean the hook parts with fresh water to remove dirt and dust that may influence proper operation.

## Monthly PMS

- All lifeboats shall be turned out monthly from their stowed position. This shall be done without any persons on-board the lifeboat.
- Davit and winch shall be lubricated.
- Clean the sight glass.
- No air bubbles in the boat compass.
- The drain plug is in place.
- Check the pressure of the air bottles (pressure not less than 150 bar)
- Check the condition of the rubber packing of access hatches.
- Check the connection of the remote control wire and manila rope.
- Check the navigation light, compass light, cabin light and search light are working satisfactorily.
- 10 • Check all the seat belts can be adjusted, and the buckle is locking properly.
- Check the inventory as per the inventory list.
- Check that lifeboat pyrotechnics are in place, valid, and in good condition.
- Check that the lifeboat ration packing is not damaged and has not expired.
- Check the steering from the helm position as well as by the emergency tiller.
- Extinguishers are secured and free to operate. The date of servicing and pressure test is to be checked.
- Check the dog handles of access hatches are free to operate.
- Check that bilges are clean and dry.
- Try out the bilge pump.
- Check that the warning signs are prominently displayed near the lifeboat winch and at the electrical control panel.
- 20 • Check the condition of the foundation bolts of the davit motor.
- Check that the "hoisting push button switch box" is in satisfactory condition.
- Check that the boat-hoisting handle is in place and in satisfactory condition.
- Check that the boat-lowering lever located on the boat deck is operating freely. Grease, if necessary.
- Check the condition of the boarding ladder and its securing arrangement on the deck.
- Check that the toolbox for the engine is in place.

### Quarterly PMS

In addition to the monthly inspection routine, following additional work shall be carried out:

- Except for free-fall lifeboat, each lifeboat shall be launched and manoeuvred in the water with its assigned operating crew at least once in three months during an abandon ship drill. The lifeboat shall be launched with only operating personnel, not with other complements.
- Check that electric hoisting switch and the emergency stop switch are working perfectly before launching.
- Check the effectiveness of the limit switch.
- Carry out inspection/maintenance of on-load release and water spray system.

### Annual PMS

- Lifeboat and launching appliances are subject to a thorough examination annually. (Scope of SER survey)
- After the thorough exam, the dynamic winch brake test (without complement) shall be carried out by the maker's authorized personnel or DGs-approved service center.
- Charge the extinguishers.
- Inspection/maintenance of the on-load release and water spray system shall be carried out as per the maker's instruction/maintenance manual by the authorized personnel.

### Five Yearly PMS

In addition to the annual inspection routine, following additional work shall be carried out:

- Lifeboat/rescue boat and launching appliances are subject to a thorough examination.
- After the thorough exam, the dynamic winch brake test (with 110% weight of fully laden lifeboat) shall be carried out by the authorized personnel or DGs approved service center.
- Replace the winch foundation securing bolts with appropriate bolts just prior to above test.

11-e) Draw out a planned maintenance schedule for accommodation ladders and pilot hoists.

Ans: While maintenance, follow standard company PPE procedure and Lock out/Tag out procedure, as well as manufacturer's safety precautions.

Monthly PMS.

- Carry out a visual inspection of the accommodation ladder and stowage arrangement to examine for corrosion, paint condition, damage/defects.
- Carry out de-rusting and paint touch-up as necessary.
- Ensure that appropriate stenciling/markings has been carried out on the accommodation ladder.
- Inspect the wires for any kinks or deterioration paying special attention to bitter ends and sections in contact with sheaves.
- Check the condition of sheaves.
- Carry out greasing/lubrication of the wires, sheaves, hinges and toggle pins. Appropriate grease/lubricant to be used.

Quarterly PMS

- All moving parts shall be free to turn and greased.
- Check the condition of ropes on the foldable handrail. Replace if needed.
- Condition of winch brake shall be inspected and brake pads replaced as necessary.
- Satisfactory operation of power supply, control system and limit switches shall be checked.

Annual PMS

- Check condition of platform.
- Check condition of all support points.
- Check all suspension points such as lugs, brackets etc.
- Check condition of stanchions and handrails.
- Check condition of turntable.

36 Month PMS

- Renew accommodation ladder wires.

Five yearly PMS

- Load test to be carried out by shore service.

## MAINTENANCE OF CARGO HANDLING EQUIPMENT

Ques 12) List out the maintenance requirements for lifting appliances over a period of 5 years (5 times)

Ans:- Same as Ques 11-b) Planned maintenance schedule for cargo handling crane

Ques 13-a) Describe the maintenance work to be carried out in a dry dock for anchor and cables, sea chests, storm valves and under water portion of the ship's hull (5-times)

Ans:- The maintenance work to be carried out in a drydock for:

(i) Anchor & cables.

- Both anchor and cables to be laid out in drydock (bitter ends to be removed) and cleaned with high pressure fresh water jet prior to examination.
- Both anchors cable to change end to end after dismantling existing end joining shackles.
- Loose studs to be welded on one side using low hydrogen electrodes.
- Joining shackles to be opened, overhauled and boxed back.
- Retaining pins on joining shackles to be renewed with stainless steel pins as required.
- Both anchor swivels clearances to be checked to ensure full housing of anchor.
- Entire length of cables and both anchors to be painted with bitumastic paint.
- Anchor shackles to be marked with white/red paint; and ss metal band.

(ii) Sea chests.

- Sea chest grids to remove.
- All sea chests inside to be thoroughly scrapped and cleaned off for scales and barnacle growth.
- All sea chests and grids to be grit blasted and cleaned with fresh water high pressure jet cleaning.
- All sea chests and grids to be painted as per the hull painting scheme.
- Wasted anodes within sea chests to be renewed.
- After completion of job all grids are fitted back with stainless steel lock washers and securing nuts.
- Ultrasonic thickness to be determined for each sea chest - approx 20 points each.
- Sea chest filter casing to open and clean thoroughly.

### (iii) Storm valves

- The storm valves are to be opened up for overhauling in workshop.
- Valve seats to be ground, lapped and internal casing to be cleaned and painted.
- Neoprene leather pads and brass retainer rings are to be renewed.
- On completion of overhauling, valves to be fitted back with new nuts/bolts and packing.
- After refitting; pressure test to be carried out and leakages if any to be rectified.

### (iv) Under water portion of ship's hull.

- Vessel to be safely docked in suitable drydock on blocks of adequate height.
- All external surfaces should be hosed with fresh water at high pressure to remove all fouling and salt deposits.
- Hand scraping (about 30% of total area) to be done after washing.
- All oil and grease stains on shipside should be removed before commencing painting.
- Grit blasting to be of SA 2.5 standard and edges of grit blasted areas to be smoothed back to a firm edge.
- 2 coat pure epoxy primer - 100 mic DFT
- 1 Epoxy tie coat - 100 mic DFT.
- 2 full coat TBT free Antifouling paint - 150 mic DFT.

13 b) Prepare the list of essential maintenance items to be covered under the Dry Dock defect list (3 times)

Ans:- The essential maintenance items to be covered under the Drydock defect list are as follows:

- 1) Hull preparation and painting.
- 2) Grit blasting and painting of decks.
- 3) Deck pipe lines surface preparation and painting.
- 4) Painting of accommodation superstructure.
- 5) Repair of damage to epoxy coating in ballast tanks, stool space and fresh water tanks.
- 6) Renewal of anodes (hull, sea chests & ballast tanks)
- 7) Anchor, anchor cables and chain lockers.
- 8) Windlass and mooring winches.

- 9) Storm valves.
- 10) Overboard discharge valves.
- 11) Main deck valves and dresser coupling.
- 12) Heating coils & steam pipelines on main deck.
- 13) Pressure testing of various lines.
- 14) Lifeboats & davits.
- 15) Accommodation ladder.
- 16) Hose handling crane, provision crane & E/R overhead crane.
- 17) Cargo/bunker manifold reducer.
- 18) Calibration of gauges.
- 19) Accommodation defects.
- 20) Sea chest grids and fitters.

Q. 4. Competence no. 18 (EMERGENCIES)

(Page No 92 to 110)



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For more notes visit the website

[marineredition.com](http://marineredition.com)

✉ : <mailto:smart@marineredition.com>

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## Q. 4. Competence no. 18 (Emergencies)

Ques 1) Who is a Port State Control Officer (PSCO)? State the purpose of a Port State Control Inspection? How are ships selected for inspection by PSC? What are clear grounds for detailed inspection during PSC inspection? (4-times)

Ans:- \* Port State Control Officer (PSCO)

- PSCO is qualified personnel to carry out Port state control inspection.
- PSCO should be an experienced officer qualified as flag state surveyor.
- PSCO carrying out inspections of operational requirements should be qualified as a master or chief engineer and have appropriate seagoing experience.
- PSCO should be able to communicate in English with the key crew.
- PSCO are free from any commercial, financial and other pressures and have no commercial interest in the port of inspection and the ships inspected.
- PSCO should not be employed by or undertake work on behalf of ROs or classification societies.

\* Purpose of Port State Control Inspection.

- To verify compliance with international conventions (such as SOLAS, MARPOL, STCW & ISM Code)
- To ensure safety of the ship and crew by checking the condition of equipment, structure and operations
- To protect the marine environment by preventing pollution from ships.
- To confirm proper manning, working conditions and operational safety management systems.
- To confirm crew competence and certification to safely operate the vessel.
- To identify and detain substandard ships that pose a risk to safety or the environment.

\* Ship selection for inspection by PSC

Ships are not inspected randomly under Port State Control (PSC).

The main factors used for selection are:

- Ship Risk Profile (SRP): Ships are classified as High Risk, standard risk or low Risk based on age, type, flag, classification society and past performance.
- Inspection interval: Priority is given to ships that are due or overdue for inspections as per PSC inspection schedules.

- History of Deficiencies or Detention: Ships with previous deficiencies, detentions or poor inspection records are more likely to be targeted.
  - Flag state performance: Ships flying flags with poor performance records (black/grey list) are inspected more often.
  - Recognized Organization (Class) performance: Vessel classed by organizations with lower performance ratings are given higher priority.
- \* Clear grounds for detailed inspection during PSC inspection.
- Clear grounds to conduct a more detailed inspection include but are not limited to:
- 1) the absence of principle equipment or arrangements required by the relevant conventions.
  - 2) evidence from a review of the ship's certificates that a certificate or certificates are invalid.
  - 3) evidence that certificates and documents required by the relevant convention are not on-board, are incomplete, are not maintained or are falsely maintained.
  - 4) evidence from the PSCO's general impressions and observations that serious hull or structural deterioration or deficiencies exist that poses risk to the structural, watertight or weathertight integrity of the ship.
  - 5) evidence from the PSCO's general impressions and observations that serious deficiencies exist in the safety, pollution prevention or navigational equipment.
  - 6) evidence that the master or crew are not familiar with essential shipboard operations relating to the safety of the ship or the pollution prevention.
  - 7) indication that key crew member may not be able to communicate with each other or with other persons on board.
  - 8) the emission of false distress alerts not followed by proper cancellation procedure.
  - 9) receipt of a report or complaint containing information that a ship appears to be substandard.

Ques 2) "Emergency preparedness" is required as per ISM code. How will this will be achieved onboard? (3times)

Ans:- ISM CODE PART-A SECTION 8: EMERGENCY PREPAREDNESS

Emergency preparedness is achieved by following ways:

- The company should identify potential emergency shipboard situations and establish procedures to respond to them.
- The company should establish programmes for drills and exercises to prepare for emergency actions.
- The safety management system should provide for measures ensuring that the company's organization can respond at any time to hazards, accidents and emergency situations involving its ship.

#### DESCRIPTION

- Contingency plans are developed for various emergency situations covering the following aspects:
  - a) Action to be taken to regain control of a situation.
  - b) Communication methods to be used on board and between ship and shore.
  - c) Procedures for requesting assistance from third parties if required.
  - d) Procedures for notifying the company and relevant authorities.
- Emergency drills are carried out.
- All completed drills shall be recorded by entries in the deck logbook.
- The effectiveness of these drills shall be formally reviewed at the monthly on-board safety committee meetings.
- Whenever the company emergency team decides that a change to a plan is necessary, this shall be carried out and transmitted to all relevant vessels.
- The shore-based contingency plan has been established to take account of the various types of emergencies which may arise on a company's vessel.
- Copies of the shipboard contingency plans for each vessel shall be retained by the DPA.
- The contingency plan shall allocate responsibilities to each member of company's emergency team and shipboard team as minimum.
- A schedule of drills for shipboard/shore based response to emergencies shall be established and distributed by the DPA.
- The Master shall complete all the specified drills as per the plan made for the

year within a period of ONE YEAR and atleast one fire and abandon ship drill every month as per the requirement of SOLAS/LSA code.

- Ship shore drill will be conducted with one of the fleet vessel on a regular basis and the results of which shall be circulated to all vessels in the fleet for their review and comments.
- The review shall also be used to improve the contingency plan onboard and ashore.

Ques 3) Briefly describe the guidelines for development of harmonized contingency plans for ship board emergencies as given in IMO Res. A. 852(20) (3-times)

Ans:- The guidelines for development of harmonized contingency plans for shipboard emergencies as given in IMO Resolution A.852(20) are as follows:-  
 For the preparation of the system, the information needs to be inserted into the individual system modules. It is divided in six modules, those are:

Module I : Introduction

- The content of this module should provide guidance and an overview of the subject-matter.

Module II : Provisions

- Basic Information
- Maintenance of the system and associated plans.
- Consistency between the system and associated plans.

Module III : Planning, preparedness and training.

- Provision for regular drills
- Provision and information for emergency training and education.
- Familiarization with the shipboard and shoreside system.
- Responsibilities / communication lines established with all parties involved.
- Information of external coordinating authorities.

Module IV : Response actions

- Initial action
- Subsequent action

Module V : Reporting procedure

- When to report
- How to report

- What to report
- Whom to contact

### Module VI: Annex(es)

- Ship's general arrangement plan.
- Bunker and ballast information.
- Additional documents (e.g. list of contact points)
- Industry guidelines.
- Cargo information etc.

Ques 4.a) A coaster has collided with you anchored ship, a loaded crude oil tanker, on which you serving as chief officer. Cargo is escaping from above the waterline. List the initial and subsequent actions that you will take (4-times)

Ans:- Following sequence of priorities to be followed for initial action to be taken in case a coaster is collided with my anchored ship, where cargo is escaping from above the waterline:

#### 1) Raise an alarm

- Sound the general emergency alarm.
- Call the Master
- Display lights/shapes/sound signals in accordance with COLREGS.
- Record & plot vessel's position.
- Record all actions of both vessel including times up to the time of collision.
- Take back-up of VDR

#### 2) Identify nature of emergency.

- Collision + Pollution.

#### 3) Recruit and organize response team, personnel and equipment

- All crew muster at their respective muster station, head count taken & PPE checked.
- Bring all pollution control items like oil boom, OSD etc.
- Alert the Oil Pollution prevention team

#### 4) Collect additional information.

- Obtain detailed information about the damage sustained to the ship.

#### 5) Start/continue response

- Master to take the necessary precautions and action as per SOPEP/SMPEP.
- Top priority is the safety of all persons onboard, along with taking steps to

- prevent the situation from worsening.
- Immediate consideration should be given to protective measures against fire, explosions and personnel exposure to toxic vapour.
  - In case of necessary movement of cargo within the ship, careful consideration is to be given to hull strength and stability.
  - Offer assistance to other ship and exchange vessel particulars.
  - Take all details of other (collided) vessel.
  - Broadcast **DISTRESS ALERT** and message if the ship is in grave and imminent danger and immediate assistance is required, otherwise broadcast an **URGENCY** message to ships in the vicinity.
  - Prepare emergency Rescue boat for launching.
- 6) Monitor response actions.
- Evaluate whether actions are controlling the situation or not.
- 7) Activate reporting procedure/prepare situation report.
- The master is obliged to report details and to inform all interested parties about the emergency and the actions taken so far by means of the fastest telecommunication channels available.
- 8) Initiate external response.
- Call for external response (if necessary)

Following sequence of priorities to be followed for subsequent action to be taken in case a coaster is collided with my anchored ship, where cargo is escaping from above the waterline:

- Check vessel's seaworthiness, buoyancy, stability, trim, list etc.
- The Master should determine whether salvage assistance will be needed or not.
- Keep a diary of events.
- Inform adjacent ships

4-b) Describe the requirements of SOLAS Chapter 11-1 relating to protective coating of dedicated sea water ballast tanks and double side skin spaces? (4-times)

Ans:- Requirements of SOLAS Chapter 11-1 for Protective coating of dedicated seawater ballast tanks of all type of ships and double side skin spaces of bulk carriers of 150m and upwards are as follows:

## Design of coating system.

### 1) Selection of the coating

- The selection of the coating system shall be considered by the parties involved with respect to the service conditions and planned maintenance.

### 2) Coating type

- Epoxy based system.
- A multi-coat system with each coat of contrasting colour is recommended.
- A top coat shall be of a light colour in order to facilitate in-service inspection.

### 3) Coating pre-qualification test

- Epoxy based systems shall be tested in laboratory prior to the date of entry into force.
- (OR), which have documented field exposure for 5 years with a final coating condition of not less than "Good" may be accepted.

### 4) Job specification

- There shall be a minimum of two stripe coat and two spray coats.
- The second stripe coats may be reduced in scope where it is proven that the NDFT can be met by the coats applied, in order to avoid unnecessary over-thickness.
- Stripe coats shall be applied by brush or roller.
- Each main coating layer shall be appropriately cured before application of the next coat, in accordance with coating manufacturer's recommendations.
- Surface contaminants such as rust, grease, dust, salt, oil etc shall be removed prior to painting.

### 5) NDFT (Nominal total dry film thickness)

- Maximum total dry film thickness shall be according to manufacturer's detailed specifications.

## Surface preparation

- Remove oil, grease, salt and dirt with solvents or fresh water washing.
- Carry out mechanical cleaning or grit blasting to SA 2.5 standard (near whitemetal).
- Smooth sharp edges, weld spatter and rough spots to prevent coating failure.
- Checking the steel surface cleanliness shall be carried out at the end of the surface preparation and before the application of the primer.

## Miscellaneous

### 1) Ventilation

- Adequate ventilation is necessary for the proper drying and curing of coating.
- Ventilation should be maintained throughout the application process and for a period after application is completed.

### 2) Environmental conditions

- Coating shall be applied under controlled humidity and surface conditions.
- The coating shall not be applied when:
  - a) the relative humidity is above 85%.
  - b) the surface temperature is less than 3°C above the dew point.

### 3) Testing of coating

- Dry film thickness shall be measured after each coat for quality control purpose.
- The total dry film thickness shall be confirmed after completion of final coat, using appropriate thickness gauges.

### 4) Repair

- Any defective areas like pin-holes, bubbles, voids etc. shall be marked up and appropriate repairs to be done.
- All such repairs shall be re-checked and documented.

Ques 5-a) Describe the immediate actions to be taken to minimize the damage to the ship following a fire or explosion. (4-times)

Ans:- In the event of a fire, the actions to be taken are:

- 1) Sound the fire alarm immediately.
- 2) Call master if not already on bridge.
- 3) Inform Bridge and Engine room with exact location and nature of fire/explosion.
- 4) Stop cargo operations, fuel transfer, and machinery if involved.
- 5) Shut down ventilation, fans and fuel supply to the affected area.
- 6) Inform terminal/port authorities (if in port).
- 7) Muster all crew at their designated muster stations.
- 8) Ensure all persons are accounted for and check if any missing or injured crew.
- 9) Record & plot vessel's position.
- 10) Note the exact time of fire alarm & name of ship's personnel who detected.

the fire.

- 11) On locating the fire, prepare for entry.
- 12) Assess fire and determine: The class of fire, Appropriate extinguishing agent, Appropriate method of attack and how to prevent the spread of the fire.
- 13) Broadcast **DISTRESS ALERT** and message if the ship is in grave and imminent danger and immediate assistance is required, otherwise broadcast an **URGENCY** message to ships in vicinity.
- 14) Monitor the effect of fire on adjoining compartments.
- 15) Start boundary cooling.
- 16) Prepare emergency rescue boat for launching.
- 17) Inform company.
- 18) Take backup of VDR/SVDR.

5.b) Prepare a contingency plan to deal with leakages and spills of dangerous cargoes inside a cargo hold. (8-times)

Ans:-

- 1) Immediate emergency response
  - Immediately stop cargo operations, evacuate all personnel from the affected hold and adjacent areas.
  - Switch off hold ventilation to prevent fume dispersion and eliminate potential ignition sources.
  - Obtain IMDG cargo information, including stow location, DG manifest, packing list, MSDS and emergency contact number.
- 2) Spillage response
  - Determine the danger (toxicity, flammability, reactivity) using the IMDG code and Ems guide.
  - Ensure crew wears appropriate PPE (SCBA, chemical-resistant suits, gloves, boots) before entering the hold.
  - The IMDG code generally recommends washing spills with plenty of water.
  - If the substance reacts dangerously with water, this should be done from as far as possible.
  - In some cases, inert absorbent can be used to contain seepage.
- 3) Safety assessment and cargo leak investigation.
  - The crew's safety must be assessed before investigating a cargo leak, especially

When entering a cargo hold.

- If the leak spreads to other cargo - especially other dangerous goods - the situation can quickly become more serious and may require expert assistance.

4) Decision-making during a leak at sea.

- If the vessel is at sea when the leak is discovered, the crew have to quickly decide whether to divert to a place where the situation can be contained and the container removed.
- Charterers to help coordinate with the terminal

5) Communication and coordination with authorities and stakeholders.

- Clear communication between owners, charters and authorities is essential to build trust.
- Authorities may also require a recognized expert contractor with a clear and comprehensive plan to handle the situation.
- If a port is reluctant to help, flag state assistance may be needed, along with reference to IMO Place of Refuge guidelines.

Ques 6) Prepare the list of immediate action plan in the event of:

a) Fire in Pump room (6-times)

Ans:- In addition to the action to be taken in case of fire (From Ques 5-a), in the event of a fire in pumproom, the following action to be taken:

- Has the pumproom been evacuated?
- Are all machineries in pumproom stopped and valves shut?
- Has pumproom ventilation been shut?
- Is pump room battened down?
- Is pumproom Fixed fire-fighting system ready for use?

b) Fire in the engine room (3-times)

Ans:- In addition to the action to be taken in case of fire (From Ques 5-a), in the event of a fire in engine room, the following action to be taken:

- Is it necessary to stop engine?
- Can fire be tackled by portable equipment?
- Is it necessary to evacuate the engine room?

- Do quick closing valves need to be actuated?
- Do emergency stops need to be actuated?
- Does emergency fire pump need to be started?
- Does emergency generator need to be started?
- Will fixed fire-fighting system be necessary?
- Has head count been taken?
- Are fire damper/flaps and funnel flap and all openings to engine room shut?

c) Fire in accommodation area (3-times)

Ans:- Same as 5-a

d) Cargo oil spillage (2-times)

Ans:- Same as 4-a

Ques 7) As a chief officer on a large container vessel, you sustain damage in way of a fuel oil tank while berthing alongside. Some quantity of fuel oil has polluted in port. List your actions to minimize the pollution damage and to protect your interest. Give a list of parties to be informed, the documentation necessary under MARPOL convention and all other necessary actions for this contingency. (5-times)

Ans:- \* The actions to minimize the pollution damage are:

Same as Ques 4.a: Initial action

\* List of parties to be informed

- Nearest coastal state harbour and terminal operators.
- Ship's owner/operator/manager.
- Charterer
- Cargo owner
- Local agent.
- P & I club and correspondents.

\* Documentation necessary under MARPOL convention.

- SOPEP (Shipboard Oil Pollution Emergency Plan)
- Incident reports.
- Photographic/video evidence.

\* Other necessary action for this contingency are:

Same as Ques 4.a: Subsequent action.

Ques 8) As a Chief officer, prepare a contingency plan:

a) Rescue of survivors from another ship at sea. (7 times)

Ans:- 1) Initial Actions

- Inform the Master immediately upon receiving distress information.
- Proceed to the distress position at maximum safe speed.
- Maintain continuous watch on VHF CH 16 and other distress frequencies.
- Establish communications with: Distress vessel (if possible) & MRCC.

2) Preparation of ship.

- Brief crew and assign duties as per muster list.
- Prepare rescue boat.
- Prepare lifebuoys with lines and lights, heaving lines, scrambling nets, pilot ladders.
- Rig pilot ladders, embarkation ladders and cargo nets for recovery.
- Keep first aid kits, stretchers, blankets ready.
- Prepare searchlights and signal lamps (especially at night).

3) Approach to casualty.

- Approach from leeward side to create a lee area.
- Reduce speed and maintain safe manoeuvring.
- Keep propeller clear of survivors.
- Post extra lookouts to maintain visual contact.

4) Rescue operations

- Launch rescue boat if conditions permit.
- Alternatively: Use lifebuoys and heaving lines.
- Recover survivors via ladders, nets or cranes.
- Give priority to: Injured persons, persons in water with flotation.

5) Recovery and on-board care

- Assist survivors on-board safely.
- Provide: First aid and medical treatment.
- Treat for hypothermia (dry clothing, blankets, warm drinks)
- Record number and condition of survivors.

6) Communication and Reporting.

- Inform MRCC of: Number of survivors rescued & their condition.
- Maintain communication with company (DPA).

- Update nearby vessels if required.

### 7) Post-Rescue actions

- Provide food, water and shelter to survivors
- Arrange for disembarkation as per instructions from MRCC.
- Complete log entries and reports.
- Conduct debriefing and review of operation.

### b) Rescuing an unconscious person from pumproom bottom platform (3 times)

Ans:-

- 1) Sound the alarm and inform Master.
  - 2) Crew mustered and duties explained.
  - 3) An emergency team ready outside the pumproom.
  - 4) Check atmosphere within the tank.
  - 5) 2 person with SCBA's ready for entry, with EEBDs for the casualty/casualties.
  - 6) Adequate ventilation and lighting of the space provided.
  - 7) First aid team ready with relevant equipment's (First aid kit, stretcher, harness, resuscitation, splints etc)
  - 8) Establish communication between rescuers and person in charge.
  - 9) After reaching the site, EEBD to be donned on the casualty.
  - 10) Casualty placed on stretcher (if external injuries sighted) or strap with harness for evacuation
  - 11) Master to inform H.O
  - 12) Transmit urgency message if required.
  - 13) Seek Radio medical advice.
  - 14) Enter all events/action taken in ship's log book.
  - 15) Notify interested parties if delay anticipated.
- After entry is completed:
- 16) All personnel accounted for as exited the space.
  - 17) All equipment confirmed removed.
  - 18) All openings closed and secured.

Ques 9) Prepare the list of immediate action plan in the event of:

a) Man overboard (2 times)

(OR),

You are at sea on your voyage & observe from Bridge that a seaman who was painting combination ladder has fallen overboard. List out all actions in chronological order you will follow in this emergency situation?

- Ans:-
- 1) Release lifebuoy with light and smoke signal on the side the crew member has fallen overboard.
  - 2) Turn the vessel around to retrace its previous path using Williamson turn. The guidelines given in IAMSAR Vol III, shall be followed for man overboard manoeuvre.
  - 3) Inform master, if not already on bridge.
  - 4) Inform Engine room. Place engines on standby.
  - 5) Sound three prolonged blasts on the ship's whistle and repeat as necessary.
  - 6) Post a lookout with binoculars and instruction to maintain a continuous watch on the man overboard.
  - 7) All crew mustered. Prepare lifeboat/rescue boat for launching.
  - 8) Hoist signal flag 'O'.
  - 9) Broadcast URGENCY message to ships in the vicinity.
  - 10) When the man overboard is located, prepare lifeboat/rescue boat to pick up the man from the water.
  - 11) Engage hand steering and commence a recovery manoeuvre.
  - 12) Take immediate avoiding action so as not to run over the man overboard.
  - 13) Note ship's position, wind speed & direction and time.
  - 14) Distribute portable VHF radios for communications.
  - 15) Rig pilot ladder/net to assist in recovery.

(b) Grounding (3 times)

Ans:-

- 1) Stop engines immediately. Inform Master.
- 2) Raise General Emergency Alarm.
- 3) Advise Engine room to change to high sea suction.
- 4) All watertight doors, to be checked closed.
- 5) Broadcast warning (if vessel's nearby) on ch 16.
- 6) Sound and display signals as per COLREGS.
- 7) Check position and update on G.M.A.S.S console.
- 8) Switch on deck lighting.
- 9) Check water around vessel for any pollution from vessel. If found, plans to be made and put into effect to control pollution as soon as possible.
- 10) Inform shore authority, if applicable.
- 11) Sound all tanks and bilges. Repeat again to confirm if any tanks breached. Visually inspect compartments where possible.
- 12) Sound depth around vessel, repeat at high/low tides and keep record.
- 13) Check tides and tidal range, next High water and next spring tides. Consider how the vessel can be lightened and ascertain nature of seabed is determined.
- 14) Broadcast **DISTRESS ALERT** and message if the ship is in grave and imminent danger and immediate assistance is required, otherwise broadcast an **URGENCY** message to ships in the vicinity.

Other checks:

- 15) Company to be informed and kept updated.
- 16) Emergency reporting to FLAG STATE to be carried out for advice prior refloating.
- 17) Consider refloating with own engine-power, in conjunction with tide.
- 18) Note and record all timings in Bell book/Deck log book carefully.
- 19) Damage to be assessed.
- 20) Extent of grounding to be assessed.

c) Collision  
(OR)

prepare a detailed emergency checklist for action to be taken in case of "collision" within the pilotage waters. (2-times)

Ans:-

- 1) Sound the general emergency alarm
- 2) Manoeuvre the ship so as to minimize effects of collision.
- 3) Close watertight doors and automatic fire doors.
- 4) Switch on deck lighting at night
- 5) Broadcast warning (if vessel's nearby) on ch 16
- 6) Make ship's position available to radio room/GMSS station, satellite terminal and other automatic distress transmitters and update as necessary.
- 7) Sound tanks after collision.
- 8) Check for fire/damage/pollution.
- 9) Offer assistance to other ship & exchange vessel particulars
- 10) Take all details of other (collided) vessel.
- 11) Broadcast **DISTRESS ALERT** and message if the ship is in grave and imminent danger and immediate assistance is required, otherwise broadcast an **URGENCY** message to ships in the vicinity.
- 12) Prepare emergency Rescue boat for launching.
- 13) Ascertain damage to other vessel
- 14) If the two vessels are interlocked, the Master, in concert with the other Master, shall, before taking any action to separate the two vessels, take into account:
  - a) Possibility of an ignition.
  - b) Reduction of buoyancy and sudden loss of stability as a direct consequence of a sudden flooding and development of a large change in list and trim.
  - c) Possibility of a larger spill
  - d) Effect on the traffic in the area.
- 15) Record all actions of both vessels including times upto the time of collision.

Ques 10) What are the contingency plans in respect to:

a) Grounding of a passenger ship on reef (2-times)

Ans:- Same as Ques 9.6

b) Ice navigation off Grand Banks of Newfoundland. (2-times)

Ans:-

- Have the following been informed of the proximity of ice?
  - Master
  - Engine room
  - crew
- Have watertight doors been shut as appropriate?
- Has speed been adjusted?
- Has the frequency of sounding tanks and bilges been increased?
- Are sea suction and propeller well below the level of any ice?
- Is trim such that the possibility of ice sliding under the vessel and blocking sea chests is avoided?
- Are sea inlets blown through?
- Have instructions been issued on the following matters?
  - monitoring ice advisory service broadcast.
  - transmitting danger messages in accordance with SOLAS chapter V.

Ques 11) Describe the procedure for rigging and effective use of ground tackle to refloat a grounded vessel (3-times)

Ans:-

- If vessel is not in tidal water, secure vessel with ground tackle.
- This is meant for the use of anchors, carefully placed at considerable distances from the ship, and connected to her by heavy wire hawsers, possibly using some lengths of chain cable.
- Heavy purchases are then rigged, often one secured to the hauling part of the other to give greater mechanical advantage and lower stress on the final hauling part, to impose a stress upon these anchors.
- This stress, which must be applied continuously, is beneficial in re-floating the ship.

Ques 12) Describe the modern tools and equipments available for damage control which can be used on-board in case of flooding or other structural damages (2 times)

- Ans:-
- 1) Damage stability software
  - 2) Flooding detection system
  - 3) Water level sensors
  - 4) Bilge Alarm system
  - 5) Fixed bilge & ballast pumps
  - 6) Portable/Emergency submersible pumps.
  - 7) Watertight doors
  - 8) Wooden plugs.
  - 9) Prefabricated plate patches.
  - 10) Quick-drying cement.

Q. 5. Competence no. 18 (SOLAS- FFA)

(Page No 111 to 140)



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## Q.5 Competence no. 18 (SOLAS - FFA)

### Regulation 10: Fire fighting

#### FIXED CO<sub>2</sub> SYSTEM

Ques 1) What are the regulations for fixed gas extinguishing system as per SOLAS? (2 times)

- Ans:-
- Fixed gas fire-extinguishing system shall comply with the provisions of the Fire Safety Systems (FSS) Code.
  - System controls shall be provided for releasing carbon dioxide into a protected space.
  - Two separate controls shall be provided for releasing carbon dioxide into a protected space. One control shall be used for opening the valve of the piping which conveys the gas into the protected space and a second control shall be used to discharge the gas from its storage containers.
  - Two controls shall be located inside a release box clearly identified for the particular space. If the box is to be locked, a key to the box shall be in a break-glass-type enclosure located adjacent to the box.
  - The openings which may allow gas to escape from a protected space shall be capable of being closed from outside the protected space.
  - The pre-discharge alarm shall be automatically activated (e.g. by opening of the release cabinet door). The alarm shall operate for the length of time needed to evacuate the space, but in no case less than 20s before the medium is released.
  - The means of control of any fixed gas fire-extinguishing system shall be readily accessible and simple to operate.

#### Quantity

- For cargo space, a minimum of 30% of the gross volume of the largest cargo space.
- For Ro-Ro space, a minimum of 45% of the gross volume of the largest cargo space.
- For machinery space, a minimum of 40% of the gross volume of the largest machinery space without casing.
- For machinery space, a minimum of 35% of the gross volume of the largest machinery space, including casing.
- For machinery space, the above figure can be reduced to 35% (for without casing) and 30% (including casing) respectively, for ships of less than 2000 GRT.

#### Release timing

- For Ro-Ro space, the arrangements shall be such that at least two thirds of the gas can be discharged into the space within 10 min.

- For machinery spaces, the arrangement shall be such that 85% of the gas can be discharged into the space within 2 min.

Others

- Safety relief devices shall be provided in each section of pipe in which there could be a build-up of pressure in excess of design pressure.
- Fixed gas fire-extinguishing systems shall be approved by the Administration based on the guidelines developed by the Organization.

Ques 2) Explain the functioning and purpose of CO<sub>2</sub> fixed firefighting system found onboard tanker ships (3 times)

Ans:- Functioning of CO<sub>2</sub> fixed firefighting system

Write same as ques 3

Purpose of CO<sub>2</sub> fixed firefighting system

- CO<sub>2</sub> works by displacing oxygen in the protected space. This effectively smothers the fire.
- It is used for machinery space. These spaces cannot be easily fought with water or foam during severe fires.
- CO<sub>2</sub> is non-conductive & residue free which makes it ideal for machinery spaces where water could cause further damage.
- CO<sub>2</sub> systems can be released quickly to flood the entire compartment.
- Prevents explosion risk.

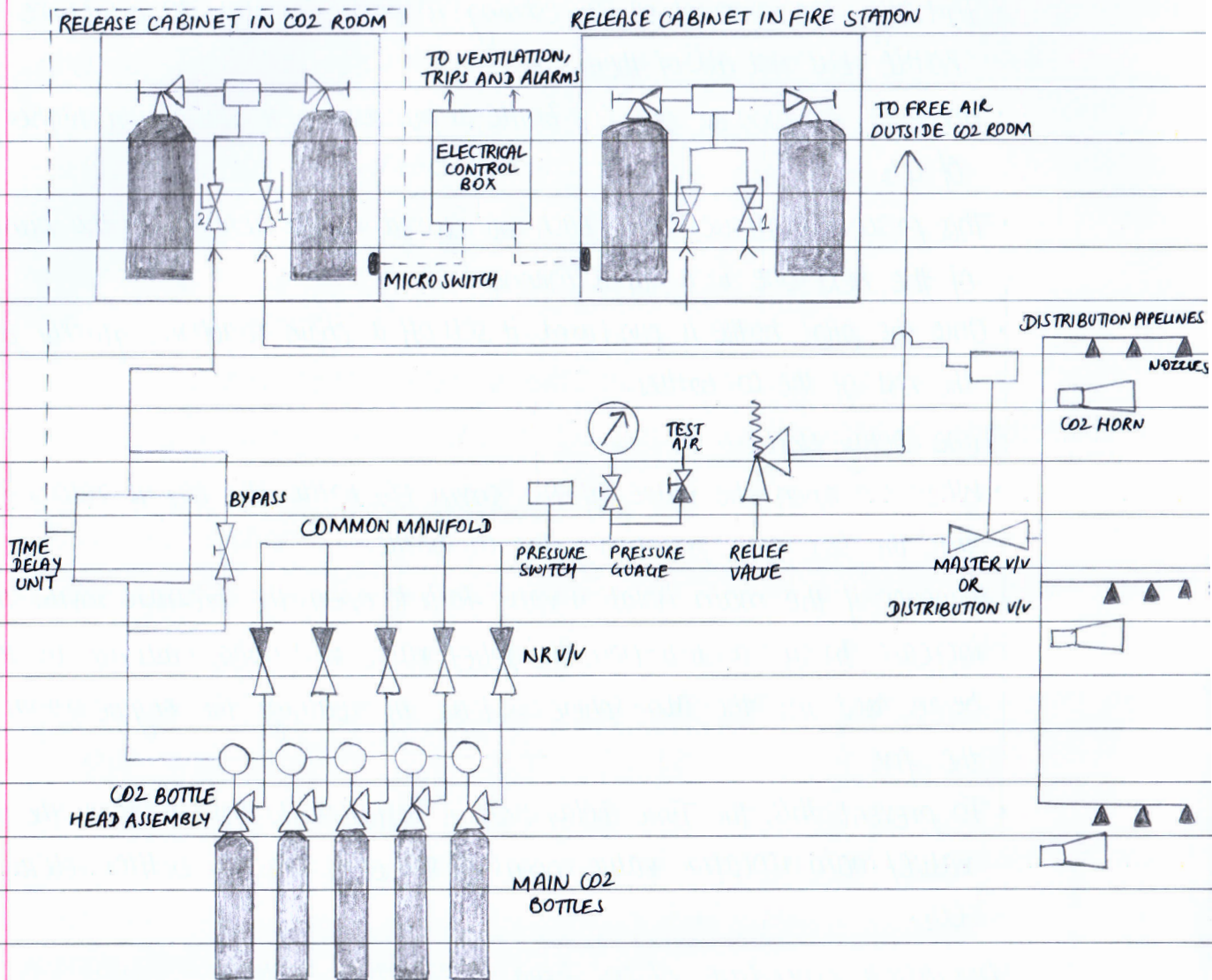
Ques 3) Draw a sketch to show working of CO<sub>2</sub> system in use on ships and describe it working (10 times)

(OR),

With the help of a suitable sketch enumerate the working principle, operating procedure of CO<sub>2</sub> fixed fire fighting system (3 times)

Ans:- Working of CO<sub>2</sub> fixed firefighting system.

SEE DIAGRAM IN  
 NEXT PAGE



- The system consists of main CO<sub>2</sub> bottles, release cabinet, master valve, common manifold and distribution pipelines.
- Whenever we open the Master control cabinet located in the CO<sub>2</sub> room, a relay is activated, triggering an alarm.
- Inside the cabinet, there are two small CO<sub>2</sub> bottles. When we open the valve on these bottles, the CO<sub>2</sub> is released.
- One line connected to CO<sub>2</sub> room, where the released CO<sub>2</sub> opens the main isolation valve, allowing the CO<sub>2</sub> to enter the room.
- Another line leads to the Time Delay unit. Time delay unit is an electronic circuit equipped with a timer. Only after the timer expires, the CO<sub>2</sub> is released from the bottle connected to the Time Delay unit.

#### Puncturing of CO<sub>2</sub> bottles:

- The CO<sub>2</sub> from the control panel flows and punctures another bottle in the CO<sub>2</sub> room.

- Initially, the amount of  $\text{CO}_2$  coming is small, enough to puncture one  $\text{CO}_2$  bottle - but not all of them.
- However, as soon as one  $\text{CO}_2$  bottle is punctured, it releases a higher quantity of  $\text{CO}_2$ .
- This process continues with each punctured bottle leading to the puncturing of the next one in a rapid manner.
- Once the pilot bottle is punctured, it sets off a chain reaction, quickly puncturing the rest of the  $\text{CO}_2$  bottles.

### Time Delay Unit

- When we open the valve of the small  $\text{CO}_2$  bottle, the  $\text{CO}_2$  is released and flows into the  $\text{CO}_2$  room, puncturing the  $\text{CO}_2$  bottle.
- However, if the main isolation valve fails to open, the pressure in the line will increase. In such a situation, the relief valve will open, causing all the  $\text{CO}_2$  to be released into the atmosphere instead of reaching the engine room to extinguish the fire.
- To prevent this, the Time Delay Unit is installed to ensure that the distribution valve/main isolation valve opens first before the  $\text{CO}_2$  bottles release the  $\text{CO}_2$ .

### Operating procedure of $\text{CO}_2$ fixed firefighting system

- Break the glass & take out the key.
- Open the release cabinet. Audio-visual alarms will sound, and ventilation blower trips will activate.
- Open one of the pilot bottle valves. Another pilot bottle is for standby.
- Open valve 1, where  $\text{CO}_2$  from the pilot bottles opens the master valve.
- Open valve 2, when  $\text{CO}_2$  from pilot bottles reaches the time delay unit, which creates the delay of 20-30s.
- After a delay,  $\text{CO}_2$  reaches the bottlehead assembly and opens all the pressure-operated cylinder valves.
- All the  $\text{CO}_2$  releases to the common manifold.
- Since the master valve is already open,  $\text{CO}_2$  is released to the protected space.

Ques 4.a) Briefly state the maintenance and testing (including pressure testing) requirements of a CO<sub>2</sub> fixed gas fire extinguishing system for Engine room/ cargo holds. (4-times)

Ans:- Weekly maintenance and testing.

- A general inspection of the system.
- Trial of ventilation/exhaust fan for CO<sub>2</sub> room.

Monthly maintenance and testing.

- Trial of CO<sub>2</sub> alarm.
- Checking of mechanical isolating valve.
- Check all releasing controls are in the proper position and readily accessible for immediate use.
- Check all discharge piping and pneumatic tubing is intact and has not been damaged.
- Check all high-pressure cylinders are in place and properly secured.
- The manual release handles shall be kept in the vicinity of cylinders and conspicuously marked.

Six monthly maintenance and testing.

- CO<sub>2</sub> lines to protected space shall be blown through with compressed air and recorded.

Annual maintenance and testing.

- All storage containers should be visually inspected for any signs of damage, rust or loose mounting hardware. Cylinders that are leaking, corroded, dented or bulging should be hydrostatically retested or replaced.
- System piping should be visually inspected to check for damage, loose supports and corrosion.
- Nozzles should be inspected to ensure they have not been obstructed by the storage of spare parts or a new installation of structure or machinery.
- The manifold should be inspected to verify that all flexible discharge hoses and fittings are properly tightened.
- Check all entrance doors to the protected space should close properly and should have warning signs, which indicate that the space is protected by a fixed CO<sub>2</sub> system and that personnel should evacuate immediately if the alarms sound.
- All remote releasing controls should be checked for clear operating instructions and indication.

### Two-yearly maintenance and testing

- All high pressure cylinders and pilot cylinders should be weighed or have their contents verified by other reliable means to confirm that the available charge in each is above 90% of the nominal charge. Cylinders containing less than 90% of the nominal charge should be refilled.
- The discharge piping and nozzles should be tested to verify that they are not blocked.

### Five-yearly maintenance and testing

- Where possible, all activating heads should be removed from the cylinder valves and tested for correct functioning by applying full working pressure through the pilot lines.
- All cable components should be cleaned and adjusted as necessary, and the cable connectors should be properly tightened.
- After completion of the work, the system should be returned to service.

### Ten-yearly maintenance and testing.

- All cylinders should be subjected to a hydrostatic test.
- Flexible hoses should be replaced at the intervals recommended by the manufacturer and not exceeding every 10 years.

Ques 4.b) What safety precautions will you take prior to inspection and maintenance of this system? (2-times)

- Ans:-
- Before performing any maintenance work, a safety plan shall be developed to account for all personnel.
  - Establish an effective communication system between the inspection personnel and the on-duty crew.
  - All measures shall be taken to avoid accidental discharge of CO<sub>2</sub>.
  - All personnel shall be notified prior to undertaking any maintenance work.
  - Maintenance and inspection shall be carried out in accordance with ship's maintenance plan and shall be based on manufacturer's instructions/ recommendation.

Ques 5) Explain why CO<sub>2</sub> is used for fire extinguishing (3-times)

Ans:- write same as Ques 2: Purpose of CO<sub>2</sub> fixed firefighting system.

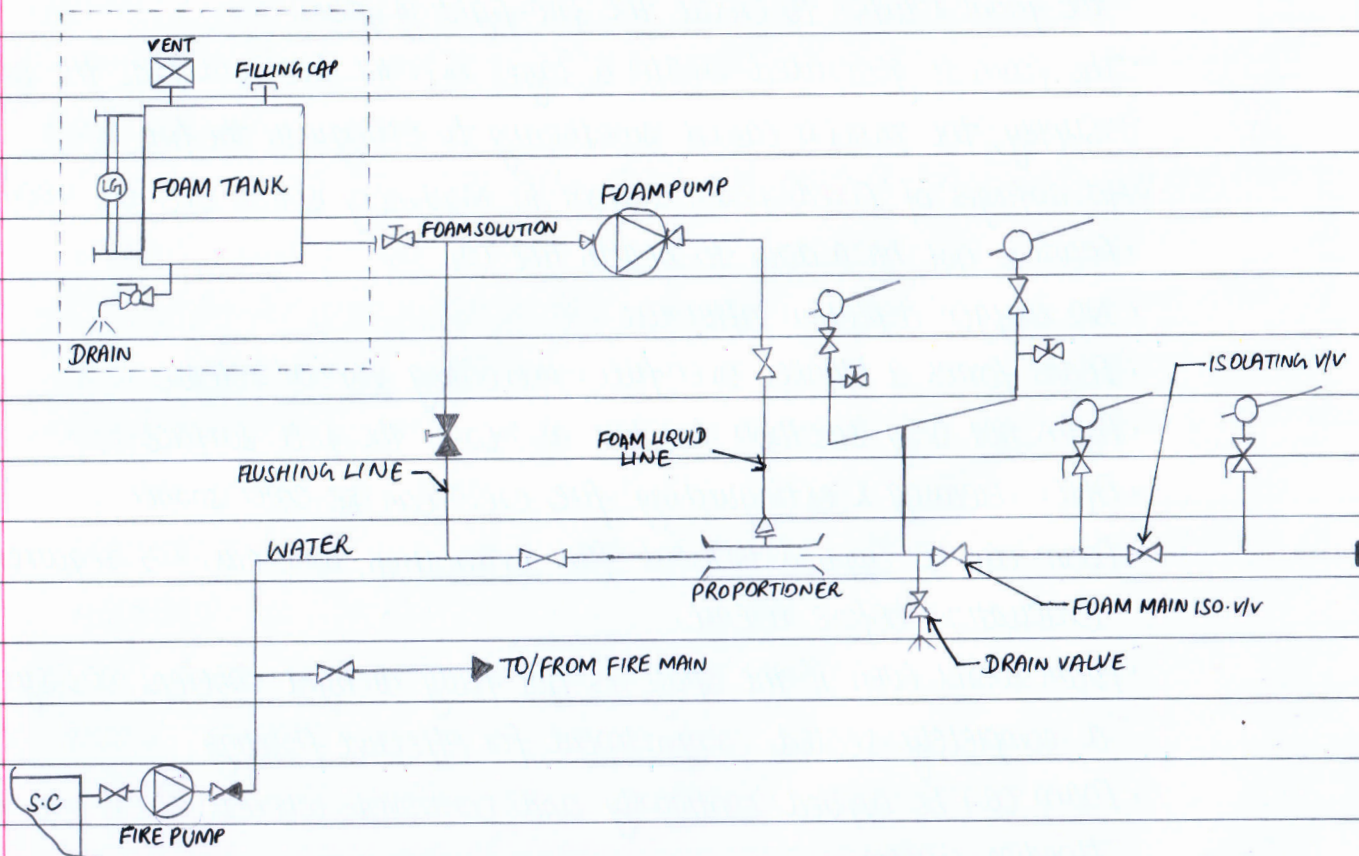
Ques 6) How would you re-enter the engine room after the fire has been extinguished by means of CO<sub>2</sub>?

- Ans:-
- Ventilate the space thoroughly to remove CO<sub>2</sub> and restore breathable air.
  - This usually requires a minimum of 30 minutes to 1 hour of ventilation depending on the size of the space and ventilation system.
  - After 6 hours is the safest and most practical choice to ensure the CO<sub>2</sub> has dissipated and the atmosphere is safe for personnel.
  - The best place for a fire-fighting team to re-enter the engine room to assess conditions is from the highest point.
  - All personnel entering must use SCBA due to high CO<sub>2</sub> concentration and oxygen depletion.
  - The atmosphere must be tested to ensure the oxygen level is back to 21% before working without breathing apparatus.

### FIXED FOAM SYSTEM

Ques 7) Explain with a labelled diagram, the working of Fixed Foam System in machinery spaces and what are its advantage over CO<sub>2</sub> system? (2-times)

Ans:-



- Fire fighting foam system on ships has three elements: foam concentrate, water, air.
- Foam concentrate is mixed with water in a correct proportion to form a foam solution. This foam solution when agitated with air produces foam.
- Foam extinguishes the fire in three ways:
  - It forms a blanket and thus removing the supply of oxygen to the fuel, the effect called smothering.
  - The foam blanket doesn't allow the fuel vapours to generate, thus cutting the fuel supply to the fire.
  - Since foam has water, it cools the fuel surface.

#### Working of fixed foam system

- The foam pump takes the foam concentrate from foam tank and injects it in desired ratio into the water.
- The proportioner controls the quantity of foam solution to inject.
- The more the fire line pressure, more foam it will inject. Ship staff are not supposed to touch the proportioner.
- When the foam solution reaches foam nozzle on deck, the air is injected into the foam solution to create the fire-fighting foam.
- The foam so generated creates a layer over the fire and cuts the oxygen supply, the process called smothering to extinguish the fire.

#### Advantages of Fixed Foam system in Machinery spaces over CO<sub>2</sub> room.

- Foam is not hazardous to health like CO<sub>2</sub>.
- No oxygen depletion after use.
- Foam forms a blanket over fuel, preventing vapour release.
- Foam not only smothers fire but also cools the fuel surface.
- After releasing & extinguishing fire, crew can re-enter sooner.
- Foam can be applied without full evacuation, whereas, CO<sub>2</sub> requires complete evacuation before release.
- Foam works even if the space is not fully airtight, whereas, CO<sub>2</sub> system needs a completely sealed compartment for effective flooding.
- Foam can be applied continuously and controlled, whereas, CO<sub>2</sub> is one-time total flooding system.

Ques 8.a) With a neatly labelled sketch explain the fixed deck foam firefighting system fitted for cargo deck protection of a chemical tanker.

Ans:- Write same as ques 7

8.b) Describe the maintenance required for the above system to ensure continuous availability.

Ans:- Weekly maintenance

- Check that all valves have freedom of movement and are in correct position.
- Check for freedom of movement of all monitors and secure them in parked position.
- Check level of foam liquid in main foam liquid tank.

Monthly maintenance

- Check electric supply to foam liquid pump. Do not run pump dry.
- Open sea water distribution valve and sea water pump. Open monitor stop valve on furthest monitor and run for a few minutes ensuring that there is no trace of foam liquid in system and that monitor performance is satisfactory. Stop sea water pumps and return all valves to normal position.
- After completion of the work, the system should be returned to service.

Quarterly maintenance

- Verify the proper quantity of foam concentrate is in the foam system storage tank.

Half yearly maintenance.

- Refer to maker's operating instructions and produce foam from any one monitor only.
- Run system for approximately three minutes to ensure that satisfactory foam is produced and that system function normally. Shut off system as per instructions.
- Refer to maker's operating instructions, after use ensure all valves are returned to their normal positions.
- Check level of foam liquid in main foam liquid storage tank and replenish as necessary.
- Check foam liquid strainer and clean as necessary.

Yearly maintenance.

- Visually inspect all accessible components for proper condition.
- Carry out function test of fixed system audible alarm.
- Check foam pump for proper pressure and capacity and confirm flow at the

required pressure in each section.

- Verify all pump relief valves, if provided, are properly set.
- Verify all filters/strainers are free of debris and contamination.
- Verify all control/section valves are in the correct position.
- Blow dry compressed air or nitrogen through the discharge piping.
- Samples of all foam concentrates carried on board are to be tested by shore services.

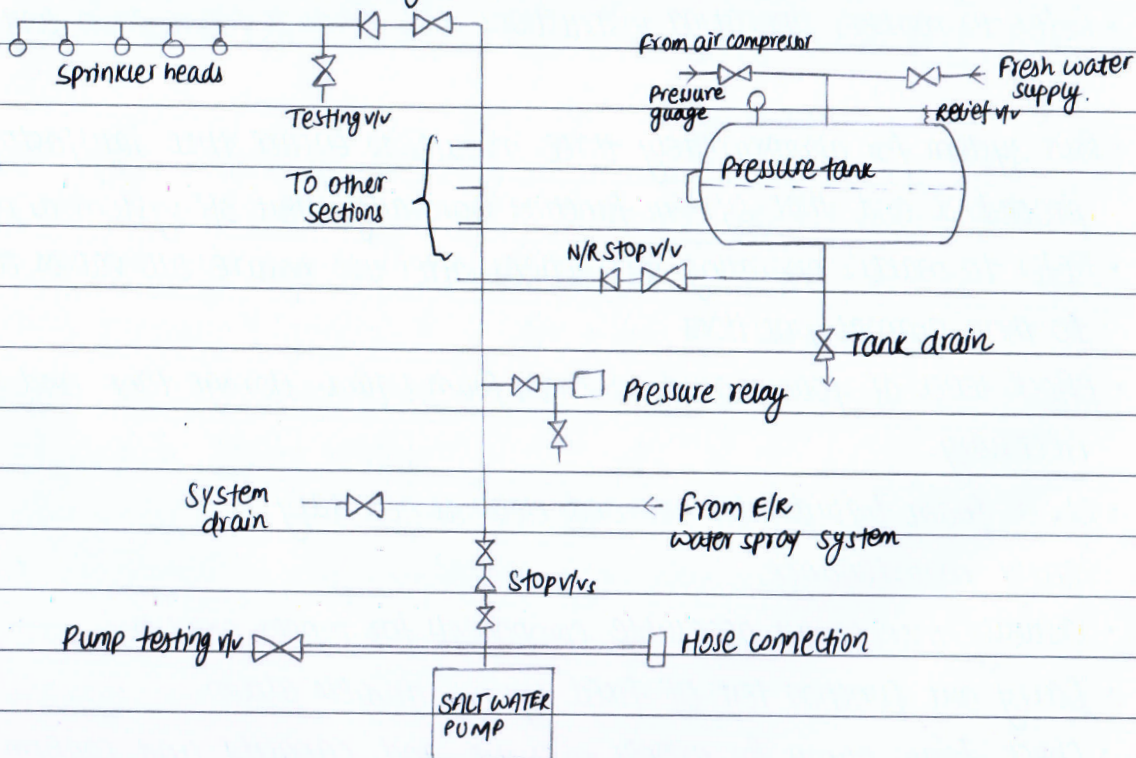
### Five yearly maintenance

- Perform internal inspection of all control valves.
- Flush all high expansion foam system piping with fresh water, drain and purge with air.
- Check all nozzles to prove they are clear of debris.
- Test all foam proportioners or other foam mixing devices to confirm that the mixing ratio tolerance is within +30 to -10% of the nominal mixing ratio defined by the system approval.

## FIXED PRESSURE WATER SPRAYING SYSTEM

Ques 9) With the help of a diagram, briefly explain the working principle, maintenance requirements and operating procedure of sprinkler and water spraying system on board passenger ships (5 times)

Ans:-



### Working principle of sprinkler and water spraying system onboard passenger ships.

- The system consists of several sections comprising a number of sprinkler heads mounted on the pipes, each section being connected through a section control valve to a sprinkler main which in turn is connected to a pressure tank and a pump.
- Number of sprinkler heads per section to be not more than 200. Each section has an alarm system.
- The entire system is initially charged with fresh water at a pressure of about 8 bar in a tank.
- Each sprinkler head has a quartzoid bulb which have a diaphragm seal in the outlet of the water pipe. This bulb is partially filled with a special fluid which expand and fill the space if there is a rise of temperature in the compartment.
- When the bulb burst, the water pressure forces the diaphragm out and water flow out from the sprinkler.
- Under the specific pressure maintained in the tank by air pressure, the water from the sprinkler is deflected outwards and broken into a fine spray by the seperated edge of the sprinkler base.
- It will adequately cover a floor area of about  $16 \text{ m}^2$  at a rate of  $54 \text{ m}^3/\text{minute}$ .
- When the sprinkler head comes into operation, the non-return valve for the section opens and water flows to the sprinkler head.
- This non return valve also uncovers the small bore alarm pipe lead and water passes through this small bore alarm pipe to a rubber diaphragm. The water pressure acts on this diaphragm and this operates a switch which cause a break in the continuously live circuit. Alarms both visible and audible, fitted in engine room, bridge and crew space are then automatically operated.
- When the system pressure dropped to 5 bar, the sea water pump will start automatically and continue supply with sea water.

### Operating procedure of sprinkler and water spraying system on-board passenger ships.

- Sprinkler activation occurs automatically when fire heat causes sprinkler head thermal elements to fail, which immediately discharge water & also trigger the alarm system which alert the crew about fire condition and system operation.

- Activation sequence includes:
  - Thermal element failure at rated temperature.
  - Immediate water discharge from activated heads.
  - Alarm activation providing visual and audible warnings.
  - Pressure drop detection starting sprinkler pump.
  - Continuous operation until manual shutdown.

### Maintenance of sprinkler and water spraying system on-board passenger ship.

- Verify proper operation of sprinkler systems using the test valves for each section.
- Visually inspect all accessible components for proper condition.
- Externally examine pressure cylinder for damage or corrosion.
- Check the hydrostatic test date of pressure cylinder.
- Functionally test audible and visual alarms.
- Flow test of all pumps for proper pressure and capacity.
- Test all antifreeze systems for adequate freeze protection.
- Verify all pump relief valves, if provided, are properly set.
- Ensure all filters/strainers are free of debris and contamination.
- 10 • Ensure all control/section valves are in correct position.
- Blow dry compressed air through the discharge piping of dry pipe systems, or confirm the pipework and nozzles are clear of any obstructions.
- Test emergency power supply switchover.
- Visually inspect all sprinklers focusing in areas where sprinklers are subject to aggressive atmosphere (like saunas, spas, galley) and subject to physical damage (like luggage handling areas, gyms, play room etc.) so that all sprinklers are inspected within one year.
- Check for any changes that may affect the system such as obstructions by ventilation ducts, pipes etc.
- Test a minimum of one section in sprinkler system by flowing water through the nozzles. The sections tested should be chosen so that all sections are tested within a five-year period.

Ques 10) Describe the onboard test procedure and interval for automatic sprinkler system and hyper mist water spray system. (2 times)

Ans: **AUTOMATIC SPRINKLER SYSTEM**

Weekly maintenance.

- The Fw Sprinkler Pump, SW Pump and the Pressure tank shall be visually inspected every week.
- Pressure gauges shall be checked during trial.
- Remote start/stop of Pumps shall be tried out once a week.

Monthly maintenance

- The drip outlets in the drain of the alarm valves to be checked during rounds.
- The stems of the shut off valves to be lubricated and strainers to be cleaned monthly.
- All Sprinkler heads to be examined for possible damage or loss of colour liquid every month and sprinkler heads shall be renewed, as required.

**HYPER MIST WATER SPRAY SYSTEM**

Monthly maintenance.

- check fresh water tank level and supply of compressed air.
- check the electric Power supply to the Pannels & High-Pressure Pump
- check manual valve at the Pump return line (to be kept open)

• Drain valves and test line connection (to be kept close)

Half-yearly maintenance

- operate the high-Pressure Pump with discharging water from test line.

- Operate the distribution valve manually to prevent sticky.
- check lubrication in the high-Pressure Pump.
- Blow through lines and nozzles to the Protected Space with compressed air.

### Yearly maintenance

- check the tension of driving belt for high Pressure Pump.
- check and clean the Strainer at the Pump section.

### 2-Yearly maintenance

- change lubricating oil in the Crank case of high-Pressure Pump.
- check and clean the Strainer installed in the mist nozzle.

### Regulation 2: Fire safety objectives and functional requirements

Ques 14) Describe fire safety objective? In order to achieve the fire safety objective what functional requirement are embodied in the regulation of SOLAS CH-11?

Ans:- The fire safety objective of this chapter are to:

- prevent the occurrence of fire and explosion.
- reduce the risk to life caused by fire.
- reduce the risk of damage caused by fire to the ship, its cargo and the environment.
- contain, control and suppress fire and explosion.
- provide adequate and readily accessible means of escape for passengers and crew.

### Functional requirements

In order to achieve the fire safety objectives, the functional requirements are as follows:

- division of the ship into main vertical and horizontal zones by thermal and structural boundaries.
- separation of the accommodation spaces from the remainder of the ship by thermal and structural boundaries.
- restricted use of combustible materials.
- detection of any fire in the zone of origin.
- containment and extinction of any fire in the space of origin.
- protection of means of escape and access for fire-fighting.
- ready availability of fire-extinguishing appliances.
- minimization of possibility of ignition of flammable cargo vapour.

## Regulation 7: Detection and alarms

Ques 12) Explain the procedure to try out all fire alarms as per routine checks.

Ans:-

1) Test the fire alarm control panel

- Check LED indicators, power supply and display messages.
- Ensure no fault or trouble signals are present.
- Confirm the panel is receiving backup power.

2) Test manual call points (Break glass units)

- Use a test key to simulate activation.
- Verify that the panel recognises the zone and triggers the alarm.
- Reset after testing.

3) Test smoke detectors

- Use smoke aerosol spray to simulate fire.
- Confirm the detector sends a signal to the panel.
- Check if the sounders activate immediately.

4) Test Heat detectors

- Apply a heat detector tester.
- Confirm the detector sends a signal to the panel.

5) Test sounders and visual alarms

- Verify that alarms are audible and visible throughout the ship.
- Walk around to confirm there are no dead zones.

6) Test battery backup

- Disconnect main power.
- Check if the system continues running on back-up batteries.

7) Reset the system:

- After all tests, reset the panel.
- Ensure no alarms or fault condition remain.

Ques 13) Explain the methods and aids available for fire detection on-board RO-RO/passenger vessels.

Ans:- On-board RO-RO vessels

Accommodation, service spaces and control stations of cargo ships shall be protected depending on a protection method adopted.

Those are:-

### a) Method IC

- A fixed fire detection and fire alarm system shall be so installed and arranged as to provide smoke detection in all corridors, stairways and escape routes within accommodation spaces.

### b) Method IIC

- An automatic sprinkler, fire detection and fire alarm system (of an approved type complying with the relevant requirements of the FSS code) shall be so installed and arranged as to protect accommodation spaces, galleys and other service spaces, except spaces which afford no substantial fire risk such as void spaces, sanitary spaces etc.
- In addition, a fixed fire detection and fire alarm system shall be so installed and arranged as to provide smoke detection in all corridors, stairways and escape routes within accommodation spaces.

### c) Method IIIC

- A fixed fire detection and fire alarm system shall be so installed and arranged as to detect the presence of fire in all accommodation spaces and service spaces, providing smoke detection in all corridors, stairways and escape route within accommodation spaces, except spaces which afford no substantial fire risk such as void spaces, sanitary spaces etc.
- In addition, a fixed fire detection and fire alarm system shall be so installed and arranged as to provide smoke detection in all corridors, stairways and escape routes within accommodation spaces.

### On-board passenger vessels.

#### a) Requirements for passenger ships carrying more than 36 passengers.

- A fixed fire detection and fire alarm system shall be installed and arranged as to provide smoke detection in service spaces, control stations and accommodation spaces, including corridors, stairways and escape routes within accommodation spaces. Smoke detectors need not be fitted in private bathroom and galleys.
- Spaces having little or no fire risk such as voids, public toilets, carbon dioxide rooms and similar spaces need not be fitted with a fixed fire detection and alarm system.

- Detectors fitted in cabins, when activated, shall also be capable of emitting an audible alarm within the space where they are located.

b) Requirements for passenger ships carrying not more than 36 passengers.

- a fixed fire detection and alarm system shall be installed and arranged as to detect the presence of fire in spaces which afford no substantial fire risk such as void spaces, sanitary spaces etc. and provide smoke detection in corridors, stairways and escape routes within accommodation spaces.

- Detectors fitted in cabins, when activated, shall also be capable of emitting an audible alarm within the space where they are located.

Ques 14) Explain about the various types of fire detectors found on oil tankers.

Ans:- a) Smoke detector

- A smoke detector, is a type of fire detectors that detects the presence of smoke particles in the air.

- Smoke detectors are fitted on various places onboard ship like Engine room, accommodation and pump room.

- The smoke sensor works on photoelectric effect by using a light source and a sensor to detect smoke.

- The detector has a light source that emits a beam of light into a sensor chamber.

- In a normal state, the beam of light is not disrupted and does not reach the sensor as light travels on straight line.

- In case when there is a fire, smoke enters the sensor chamber, it scatters the light and reflects it onto the sensor, triggering an alarm.

b) Heat detector

- Heat detectors are devices that are designed to detect changes in temperature, which can indicate the presence of a fire.

- Heat detectors work by measuring the temperature in a given area and triggering an alarm if the temperature exceeds a certain threshold.

c) Flame detector

- A flame sensor is a type of sensor that is used to detect the presence of a

flame or fire.

- Flame sensors work by detecting the presence of infrared radiation emitted by a flame.
- When a flame is present, it emits infrared radiation that is detected by the sensor.
- The sensor then sends a signal and activates the system.
- It is fitted in places of Main Engine room, Generators, Purifiers and Boilers.

Ques 15) With the help of a suitable sketch enumerate the operating principle and maintenance requirements of smoke detection system fitted for cargo holds. (2-times)

Ans:- \* Operating principle of smoke detection system  
Write same as Ques 14

\* Maintenance requirement of smoke detection system

Daily maintenance

- Check the system is operational, power supply and indication lamps.

Weekly maintenance

- Check the power "ON" indicator is lit and that there is no fault indication.
- Carry out zone wise operational test.

Monthly maintenance

- Activate one detector in each zone and check for alarm. Reset the system. Select different detector each time in rotation.

Six monthly maintenance

- All smoke detectors shall be checked in a phased manner and covered in six months and recorded. Suitable testing kit shall be used.

Yearly maintenance

- Visually inspect all accessible detectors for evidence of tampering, obstruction etc., so that all detectors are inspected within one year.
- Clean or change detectors as required.
- Test any detectors, which have not been tested since the last annual check.

## Regulation 9: Containment of Fire

Ques 16) What is a Standard Fire Test? Describe the class divisions for structural fire protection on ships. (2-times)

Ans:- STANDARD FIRE TEST

- Standard fire test is one in which specimen of the relevant bulkhead or decks are exposed in a test furnace to temperature corresponding approximately to the standard time temperature curve.
- The specimen shall have an exposed surface of not less than  $4.65 \text{ m}^2$  and height (or length of deck) of  $2.44 \text{ m}$ , resembling as closely as possible the intended construction and including where appropriate at least one joint.
- The standard time-temperature curve is defined by a smooth curve drawn through the following internal furnace temperature points:
  - initial internal furnace temperature:  $20^\circ\text{C}$
  - at the end of the first 5 minutes:  $576^\circ\text{C}$
  - at the end of 10 minutes:  $679^\circ\text{C}$
  - at the end of 15 minutes:  $738^\circ\text{C}$
  - at the end of 30 minutes:  $841^\circ\text{C}$
  - at the end of 60 minutes:  $945^\circ\text{C}$

### CLASS DIVISIONS FOR STRUCTURAL FIRE PROTECTION

(i) "A" class divisions

"A" class divisions are those divisions formed by bulkheads and decks which comply with the following:

- they are constructed of steel or other equivalent material.
- they are suitably stiffened.
- they are insulated with approved non-combustible materials such that the average temperature of the unexposed side will not rise more than  $140^\circ\text{C}$  above the original temperature, nor will the temperature at any one point, including any joint, rise more than  $180^\circ\text{C}$  above the original temperature, within the time listed below:

→ Class A-60: 60 minutes

→ Class A-30: 30 minutes.

→ Class A-15 : 15 minutes

→ Class A-0 : 0 minutes.

- they are constructed as to be capable of preventing the passage of smoke and flame to the end of the one-hour standard fire test
- The administration has required a test of a prototype bulkhead or deck in accordance to the Fire Test procedure code to ensure that it meets the above requirement for integrity and temperature rise.

(ii) "B" class divisions

"B" class divisions are those divisions formed by bulkheads, deck, ceilings or linings which comply with the following:

- they are constructed of approved non-combustible material.
- they have an insulation value such that the average temperature of the unexposed side will not rise more than  $140^{\circ}\text{C}$  above the original temperature, nor will the temperature at any one point, including any joint, rise more than  $225^{\circ}\text{C}$  above the original temperature within the time listed below:

→ Class B-15: 15 min

→ Class B-0: 0 min.

- they are constructed as to be capable of preventing the passage of flame to the end of the first half hour of the standard fire test.
- The administration has required a test of a prototype bulkhead or deck in accordance to the Fire Test procedure code to ensure that it meets the above requirements for integrity and temperature rise.

(iii) 'C' class divisions

- 'C' class divisions are division constructed of approved non-combustible materials.
- They neither meet requirements related to the passage of smoke and flame nor limitation relative to the temperature rise.

Ques 17) Define - (i) "A" class division (ii) "B" class division (iii) "C" class divisions  
 (iv) Bulkhead deck.

Ans:- (i), (ii), (iii) :- Write same as Ques 16.

(iv) Bulkhead deck

Bulkhead deck is the uppermost deck upto which the transverse watertight bulkheads are carried.

## Regulation 10: Fire Fighting

Ques 18) Describe the maintenance and inspection procedures for portable fire extinguishers, fire dampers, fire hydrants and fire hoses and nozzles. (4-times)

Ans:- **PORTABLE FIRE EXTINGUISHERS**

### Monthly maintenance and inspection

- All extinguishers shall be subject to a visual external check.
- All extinguishers shall be stowed in their respective positions with the plunger caps/pins in place to prevent accidental release.
- The date of filling and the date on which the extinguisher has been tested shall be clearly stencilled on the cylinder.

### Annual maintenance and inspection

- All fire extinguishers must be checked for proper location, charge pressure and condition according to the ship's Fire control Plan.
- All fire extinguisher should be serviced at interval not exceeding one year.
- This servicing can be undertaken by ship-staff with all necessary procedures, work instructions, tools and equipment readily available.
- Each extinguisher should be provided with a sign (maintenance label) clearly indicating that it has been examined on a certain date by a competent person.
- Record of inspections should be maintained on-board for verification, showing the date of inspection, the type of maintenance carried out.
- Charges of dry chemical/water type fire extinguishers should be renewed if, on checking, there is any indication of deterioration in the contents or as specified by the manufacturer, but in any case not later than once every five years.
- The premixed agent in liquid charge-type AFFF (aqueous film-forming foam) and FFFP (film-forming fluoro-protein foam) fire extinguisher shall be replaced once every year. The agent in solid charge-type AFFF fire extinguishers shall be replaced once every 5 years.
- Carbon dioxide extinguisher and gas repellent cartridges should be recharged or renewed if the gas loss by weight exceeds 10% of the original charge.
- At least one dry powder extinguisher should be discharged annually at random basis and the retention of the content checked.
- Any extinguisher or bottle which indicates excessive corrosion shall be replaced.

### Five Year maintenance and inspection

- Atleast one extinguisher of each type should be test discharged once every fire-year intervals (as part of a fire drill), in any case.

### FIRE DAMPERS

#### Quarterly and Annual testing and inspection.

- Test all fire damper for local operation.

### FIRE HYDRANTS AND FIRE HOSES & NOZZLES

#### Monthly maintenance and inspection

- Fire hoses shall be drained, dried up, coiled and stowed in the shade after use to prevent them from becoming brittle.
- Verify all fire hydrants, hose and nozzles are in place, properly arranged and are in serviceable condition. (Coupling and rubber washer are in good condition, hydrants and nozzles shall be lubricated, outside surface shall be polished and free of salt deposits).
- Fire hose boxes shall be kept well maintained.

#### Quarterly maintenance and inspection.

- Verify international shore connection is in serviceable condition, if fitted.

#### Annual maintenance and inspection.

- Visually inspect all accessible components for proper condition.
- Test all hydrant valves for proper operation and ensure no leakage.
- All fire hoses shall be tested upto working pressure.
- Ensure all fire nozzles are of correct size/type, maintained and working.
- Relief valve on fire line shall be overhauled annually. Verify the setting of relief valve pressure once in a year.

Ques 19) Describe the complete maintenance procedure i.e. weekly, monthly, quarterly, yearly and five yearly routines for EEBD, SCBA sets and the associated fireman's outfit? (2 times)

Ans:- SELF-CONTAINED BREATHING APPARATUS AND FIREMAN'S OUTFIT

#### Weekly maintenance

- Confirm all breathing apparatus cylinder guages are in the correct pressure range.

### Monthly maintenance

Verify lockers providing storage of the units containing their full inventory and equipment is in serviceable condition. Following checks shall include:

- gas tightness of the mask
- cleanliness of visor
- elasticity of mask bands
- leakages in hoses and attachments
- torch
- helmet
- fireman's axe and the protective clothing
- The air pressure of the SCBA bottle and the whistle

### Annual maintenance

- Analysis of SCBA compressor output air to be done by approved agency and records shall be maintained.
- Check all breathing apparatus face masks and air demand valve are in serviceable condition.

### Five Year Service

- All SCBA cylinders shall be hydrostatically pressure tested and records to be maintained.

## EMERGENCY ESCAPE BREATHING DEVICE (EEBD)

### Weekly maintenance

- Confirm all EEBD cylinder gauges are in the correct pressure range.

### Monthly maintenance

- Inspect the tamper-proof seal and indicator tag to confirm the device is unused and intact.
- Wipe down the exterior housing, mask or hood to remove any dust, dirt or contaminants.
- If using a compressed air EEBD, check the pressure gauge to ensure it remain within the safe range.
- Verify that all labels, instruction and safety warnings are legible and securely attached.

### Annual maintenance

- Check the EEBD expiration date.

- Conduct a partial function test if permitted by the manufacturer, ensuring activation mechanism work properly.
- Verify that training records for personnel using EEBDs are up to date.
- Assess whether any new workplace safety regulations or industry standard affect your EEBD maintenance plan.

#### Five Year Service

- All EEBD cylinders shall be hydrostatically pressure tested and records to be maintained.

Ques 20) Describe the fixed and portable fire-extinguishing arrangements provided in machinery space of oil tanker? (3 times)

Ans:- SOLAS CH 11-2 Regulation 10.5

#### Fixed fire extinguishing system

- Machinery space containing oil-fired boilers or oil fuel units shall be provided with the fixed fire-extinguishing system.
- Machinery space containing internal combustion machinery shall be provided with the fixed-fire extinguishing system.
- Machinery spaces containing steam turbines or enclosed steam engines used for main propulsion or other purposes having a total output of not less than 375 kW shall be provided with the fixed fire-extinguishing systems.

#### Additional fire extinguishing systems

a) For machinery space containing oil-fired boilers or oil fuel units

- There shall be atleast one portable foam applicator unit in each boiler room or at an entrance outside of the boiler room complying with the provisions of the FSS code.
- There shall be atleast two portable foam extinguisher in each firing space in each boiler room and in each space in which a part of the oil fuel installation is situated.
- There shall be atleast one approved foam type extinguisher of atleast 135L capacity in each boiler room.

b) For machinery space containing internal combustion machinery.

- There shall be atleast one portable foam applicator unit complying with the provisions of the FSS code.

- There shall be sufficient number of approved foam-type fire extinguishers of atleast 45L capacity.
  - There shall be sufficient number of portable foam extinguisher located so that no point in the space is more than 10m walking distance from an extinguisher and that there are atleast two such extinguishers in each such space.
- c) For machinery spaces containing steam turbines or enclosed steam engines.
- There shall be sufficient number of approved foam-type fire extinguisher of atleast 45L capacity.
  - There shall be sufficient number of portable foam extinguisher located so that no point in the space is more than 10m walking distance from an extinguisher and that there are atleast two such extinguishers in each such space.

### Regulation 14: Operational readiness and maintenance

Ques 24) Briefly describe the SOLAS requirements relating to 'operational readiness and maintenance' of life-saving and fire-fighting appliances on board ships as detailed in chapter II and III of SOLAS? (5 times)

Ans:- Chapter II-2 Regulation 14: Operational readiness and maintenance. (FFA)

#### 2-1 Operational readiness

- The following fire protection system shall be kept in good order to ensure their required performance if a fire occurs
  - structural fire protection.
  - fire detection and fire alarm system.
  - means of escape system and appliances.
- Fire-fighting systems and appliances shall be kept in good working order and readily available for immediate use.
- Portable extinguisher which have been discharged shall be immediately recharged or replaced with an equivalent unit.

#### 2-2 Maintenance, testing and inspection.

- Maintenance, testing and inspection shall be carried out based on the guidelines developed by the organization.
- The maintenance plan shall be kept onboard the ship and shall be available for inspection whenever required by the Administration.
- The maintenance plan shall include atleast the following fire protection and

fire-fighting systems and appliances, where installed:

- fire mains, fire pumps and hydrants including hoses, nozzles and international shore connections.
  - fixed fire detection and fire alarm system.
  - fixed fire-extinguishing system
  - other fire-extinguishing appliances.
  - automatic sprinkler, fire detection and fire alarm system.
  - ventilation system including fire and smoke dampers, fan and their controls.
  - emergency shut down of fuel supply.
  - fire doors including their controls.
  - general emergency alarm systems.
  - emergency escape breathing devices.
  - portable fire extinguishers including spare charges
  - fire-fighter's outfit.
- The maintenance programme may be computer based.

**Chapter III Regulation 20:** Operational readiness, maintenance and inspection. (LSA)

Write same as Ques 1 of Q-1. Competence no 17-1-17-5 (SOLAS-LSA)

### Regulation 15: Instructions, onboard training and drills

Ques 22) What should be the contents and use of the ship's FFA training manual? Who is to provide this manual, in how many copies and where should this manual be kept on-board?

Ans:- Contents of the ship's FFA training manual

- general fire-safety practice.
- general instructions on fire-fighting procedure.
- precautions related to the dangers of smoking, electrical hazards, flammable liquids and similar common shipboard hazards.
- procedures for notification of a fire and use of manually operated call points.
- meaning of the ship's alarm.
- operation and use of fire-fighting system and appliances.
- operation and use of fire doors

### Use of the ship's FFA training manual

- Provide instructions on how to operate all fire-fighting appliances on-board.
- Helps new crew members becomes familiar with equipment and procedures.
- Give safety precaution for handling fire-fighting appliances.

Who is to provide?

The ship's FFA training manual is provided by the shipowner/company, but it usually prepared using information supplied by equipment manufacturers and in compliance with international regulations.

How many copies?

Atleast 1 copy of the FFA training manual is required on-board. Multiple copies available on-board for easy access

Where should this manual be kept on-board

A training manual shall be provided in each crew mess room and recreation room or in each crew cabin.

### Regulation 2: Fire safety objective and functional requirements

Ques 23) When designing a ship, what are the basic principles to be followed to control the damage caused by fire? (5 times)

Ans:- Write same as Ques 11: Functional requirements.

### Regulation 19: Carriage of dangerous goods

Ques 24) List out the additional fire fighting equipment required for carriage of dangerous cargoes. (4 times)

- Ans:-
- Arrangements shall be made to ensure immediate availability of a supply of water from the fire main at the required pressure either by permanent pressurization or by suitably placed remote arrangements for the fire pumps.
  - The quantity of water delivered shall be capable of supplying four nozzle at pressure capable of being trained on any part of the cargo space when empty.
  - Means shall be provided for effectively cooling the designated underdeck cargo space by atleast  $5 \text{ l/min/m}^2$  of the horizontal area of cargo spaces, either by a fixed arrangement of spraying nozzles or flooding the cargo space with water.
  - Four sets of full protective clothing chemical resistant, shall be provided in addition to the fire-fighter's outfit.

- At least two self contained breathing apparatuses additional to those required by Regulation 10 shall be provided. Two spare charge suitable for use with the breathing apparatus shall be provided.
- Portable fire extinguishers with a total capacity of at least 12 kg of dry powder or equivalent shall be provided for the cargo spaces. These extinguisher shall be in addition to any portable fire extinguisher required elsewhere in this chapter.
- Spaces not capable of being sealed, shall be fitted with an approved fixed pressure water-spraying system for manual operation.

## OTHERS

Ques 25) With respect to an oil tanker how each of the following achieved: (2 times)

a) Prevention of fire & explosion in cargo tank

Ans:- Prevention of fire & explosion in cargo tanks are achieved by firefighting arrangement provided in cargo tanks.

- Fixed deck foam system: For tankers of 20,000 tonnes deadweight and upwards, a fixed deck foam system shall be provided in accordance with the requirement of the FSS code. Tankers of less than 20,000 DWT shall be provided with a deck foam system complying with the requirement of FSS code.

- Inert gas system: For tankers of 20,000 deadweight and upwards, the protection of the cargo tank shall be achieved by a fixed inert gas system in accordance with the requirements of the FSS code.

b) Prevention of fire & explosion in Accommodation and Machinery spaces.

Ans:- Prevention of fire & explosion in accommodation and machinery spaces are achieved by firefighting arrangement provided in Accommodation and machinery spaces.

Firefighting arrangement provided in Accommodation spaces.

- Passenger ships carrying more than 36 passengers shall be equipped with an automatic sprinkler, fire detection and fire alarm system of an approved type complying with the requirements of the FSS code in all control stations, accommodation and service spaces, including corridors and stairways.

- Passenger ship carrying not more than 36 passengers, when a fixed smoke detection and fire alarm system complying with the provisions of the FSS code is provided only in corridors, stairways and escape routes within accommodation spaces, an automatic sprinkler system shall be installed.
- A fixed pressure water-spraying fire-extinguishing system complying with the provisions of the FSS code shall be installed on cabin balconies of passenger ships.
- Paint locker shall be protected by a CO<sub>2</sub> system/ dry powder system/ sprinkler system approved by the Administration.
- Flammable liquid locker shall be protected by an appropriate fire-extinguishing arrangement approved by the Administration.
- Automatic or manual fire extinguishing system for deep fat cooking equipment.

Firefighting arrangement provided in machinery space

Write same from Ques 20

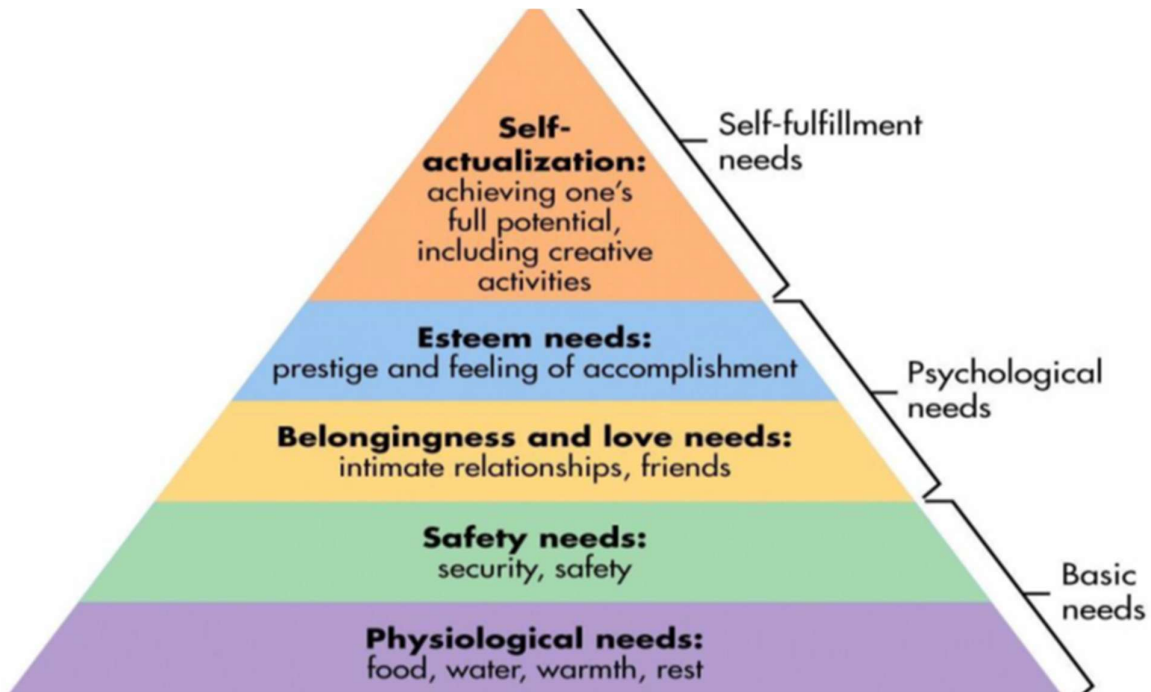
#### c) Prevention of Fire & Explosion in cargo pump room

Prevention of fire & explosion in cargo pump room are achieved by fire fighting arrangement provided in cargo pump room.

- Fixed CO<sub>2</sub> fire-fighting system: Each cargo pump shall be provided with fixed fire-extinguishing system operated from a readily accessible position outside the pumproom, complying with the provisions of the FSS code.
- High expansion foam system: A high expansion foam system complying with the provisions of the FSS code, provided that the foam concentrate supply is suitable for extinguishing fire involving the cargoes carried.
- Water spraying system: A fixed pressure water-spraying system complying with the provisions of the FSS code.

**Q. 6. Competence no. 19 (LEADERSHIP AND MANAGERIAL SKILLS- Motivation, Team working skills, Resource management, Effective Communication)**

(Page No 141 to 158)



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**Q.6 Competence no. 19 (LEADERSHIP AND MANAGERIAL SKILLS- Motivation, Team working skills, Resource management, Effective Communication)**

**MOTIVATION**

1) Motivation is key factor for performance enhancement. As a Mate, how will you motivate your subordinates in order to achieve optimum performance level? (6 times)

(OR),

How will you motivate your crew in order to extract the maximum output from them? (4 times)

(OR),

Explain with reference to Maslow's hierarchy theory, how you will motivate your subordinates to give maximum productivity in their daily during their full tenure? (2 times)

(OR),

Explain Maslow's theory of hierarchy and how you can use it to motivate your crew whose sign off has been delayed due to COVID-19 pandemic.

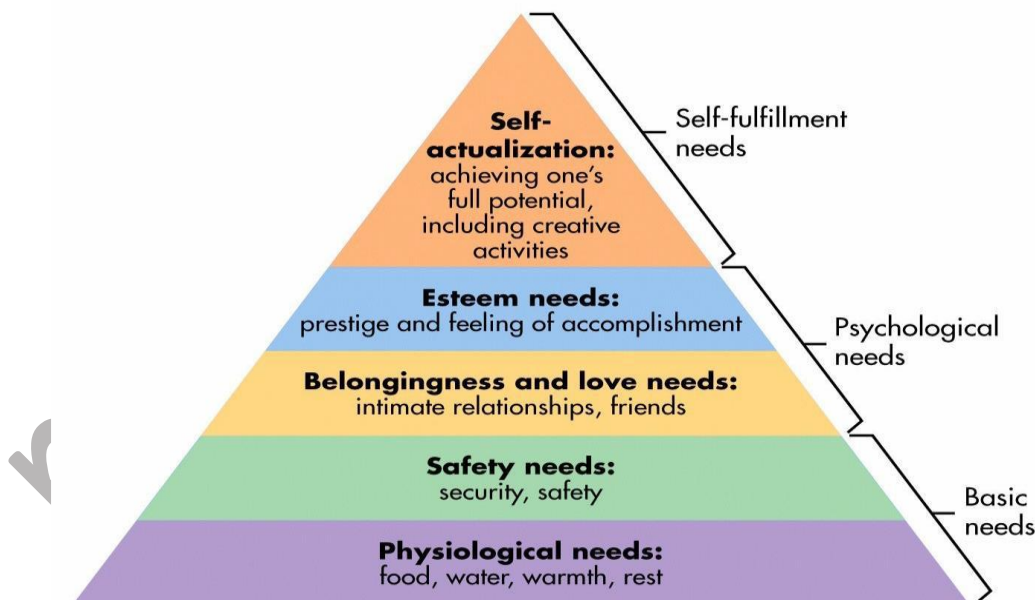
(OR),

What are the different techniques that can be adopted to motivate the crew members on board the ship to obtain optimum results?

**Ans:** To motivate my subordinates or crew in order to achieve optimum performance/extract the maximum output, OR, to motivate in difficult times, we will use Maslow's hierarchy theory of Motivation.

**Maslow's theory of Motivation:**

- It is known as theory of needs hierarchy and is developed by Abraham Maslow in 1940s.
- The assumption underlying this theory is that human needs can be arranged in a hierarchy as per the importance.
- The most basic needs form the foundation.
- According to him, person is motivated by unfulfilled needs. When a need is satisfied, it no longer works as motivator for individual.



- The needs can be classified into five types:
  - (a) **Physiological needs:** These are the basic biological needs. It includes need for air, food, water, shelter, rest, sex. The fulfilment of these needs is very much required for survival of individual. Only after fulfilment of these needs either fully or partially the higher order needs for individual emerge. These needs have tremendous impact on behaviour of individual. E.g: The individual who is very hungry may steal food for satisfying the hunger. That is why it is necessary to give appropriate salary to employees so that they can fulfil this basic need.

- (b) **Safety and security needs:** Once basic biological needs are satisfied then these needs emerge. These include a) Security from danger such as Fire, accident and b) Economic security includes salary, gratuity, and medical allowance. These needs are related to financial security.
- (c) **Belongingness needs:** It includes need or love, belongingness and affection. Man is a social animal hence cannot survive if out casted by the group. He or she may go in depression. Hence, it is very important that this need to be taken care of. These needs focus on social aspect at work place. It can be fulfilled by providing recreational facilities and gives importance to team work.
- (d) **Esteem needs:** Also known as ego needs. They are the needs for self-esteem and the respect from others. Fulfilment of these need leads to development of self-confidence, feeling of self-worth and self-respect. It can be fulfilled by incentives either as promotion or reward for achieving the targets.
- (e) **Self-actualisation needs:** This is the growth need. It includes the motive to prove the talent one has. A self-actualised person works hard for self-development. It can be fulfilled by assigning the challenging tasks

**Using the Maslow's theory of Motivation on-board to motivate crew & sub-ordinates:**

Applying Maslow's Hierarchy of Needs on board a ship is very practical because crew performance depends heavily on how well their needs are satisfied at different levels. As a Mate, you can motivate your subordinates by addressing each level systematically:

- (a) **Physiological needs:**
  - Ensure good quality food, clean drinking water, and hygienic accommodation
  - Maintain proper rest hours (avoid fatigue)
  - Adequate ventilation, lighting, and sanitation
- (b) **Safety and security needs:**
  - Strict adherence to safety procedures and PPE usage
  - Conduct regular drills (fire, abandon ship, enclosed space entry)
  - Ensure equipment is well maintained
  - Provide job security and fair treatment
- (c) **Belongingness needs:**
  - Promote teamwork during operations
  - Encourage group activities (sports, movie nights)
  - Maintain good interpersonal relationships
  - Resolve conflicts quickly and fairly
- (d) **Esteem needs:**
  - Appreciate good work publicly
  - Give constructive feedback
  - Assign responsibility based on competence
  - Avoid humiliation; correct mistakes privately
- (e) **Self-actualisation needs:**
  - Provide training and skill development opportunities
  - Encourage certifications and career progression
  - Delegate challenging tasks to capable crew
  - Mentor juniors for future roles

**2) Does motivation come from within a person or is it a result of situation? Explain with the help of relevant theory and shipboard examples? (6 times)**

Write answer from Q. 1

**3) How will you motivate your junior officers as part of bridge team management?**

Write answer from Q. 1 + few more points related to bridge from own based on practical knowledge

4) As a chief officer you have to balance company and operational requirements with the personal demand of junior officer and crew on board. In which way can you encourage and motivate your subordinates onboard?  
(3 times)

(a) Leadership & Communication

- **Lead by example:** Demonstrate professionalism, punctuality, and adherence to safety standards. Crew members mirror the behaviour of their leaders.
- **Open communication:** Encourage junior officers and crew to voice concerns or suggestions. Regularly hold short, informal meetings to keep everyone aligned.
- **Transparency:** Explain the “why” behind company policies or operational requirements. When people understand the reasoning, they’re more likely to cooperate.

(b) Recognition & Empowerment

- **Acknowledge good work:** Simple recognition—like praising a well-executed maintenance job—boosts morale.
- **Delegate responsibility:** Give junior officers ownership of tasks. It builds confidence and shows trust in their abilities.
- **Encourage initiative:** Support crew members who propose improvements or innovative solutions.

(c) Training & Development

- **Mentorship:** Guide junior officers through practical decision-making, not just theoretical knowledge.
- **Skill development:** Organize short training sessions or drills that enhance competence and confidence.
- **Career guidance:** Show interest in their professional growth, helping them see the bigger picture beyond the current voyage.

(d) Balancing Work & Welfare

- **Fair workload distribution:** Ensure tasks are shared equitably to avoid fatigue and resentment.
- **Rest and recreation:** Respect rest hours and encourage recreational activities when possible.
- **Crew welfare:** Pay attention to small things—meal quality, cabin conditions, or access to communication with family.

(e) Safety & Trust

- **Safety culture:** Reinforce that safety is non-negotiable, but also empower crew to stop unsafe practices without fear.
- **Trust building:** Be approachable and consistent. Crew members should feel confident that you’ll support them when challenges arise.

5) What you understand by Motivation and discuss regarding sources of motivation.

- Motivation is the internal drive or external influence that stimulates individuals to take action, achieve goals, and meet their personal or organizational objectives.
- Onboard a ship, motivation is crucial for maintaining high levels of performance, safety, and operational efficiency.
- It plays a significant role in how crew members approach their work, interact with others, and handle challenging situations.

Types of Motivation

1. **Intrinsic Motivation:** Intrinsic motivation refers to the internal desire to perform a task for the inherent satisfaction or fulfilment it brings, rather than for an external reward.

**Example:** A crew member might take personal pride in mastering a skill, such as navigation or cargo handling, simply for the joy of learning and improving.

**Key Characteristics:** Driven by personal growth, curiosity, and a sense of accomplishment.

2. **Extrinsic Motivation:** Extrinsic motivation is driven by external factors, such as rewards, recognition, or fear of punishment.

**Example:** A crew member may work harder to receive a promotion or a performance-based bonus.

**Key Characteristics:** Dependent on external rewards or consequences. Can be effective for short-term goals.

## Sources of Motivation

1. **Personal Ambition and Goals (Intrinsic):** Many people are motivated by a desire to achieve personal goals, such as career advancement, self-improvement, or learning new skills.

**Example:** A newly promoted deck officer may be motivated to learn faster and take on more responsibilities to become an effective leader on board.

2. **Job Satisfaction and Recognition (Extrinsic and Intrinsic):** Positive feedback, recognition from superiors, and achieving personal satisfaction in completing tasks can be strong motivators.

**Example:** A crew member receiving public acknowledgment for handling an emergency situation effectively may feel motivated to continue performing well.

3. **Monetary Rewards (Extrinsic):** Financial incentives such as bonuses, salary increases, or performance-based rewards.

**Example:** A bonus for successfully completing a difficult voyage or reaching safety milestones may motivate the crew to maintain high performance standards.

4. **Work Environment (Extrinsic):** A positive, respectful, and collaborative work environment can significantly enhance motivation.

**Example:** Crew members who feel they are part of a supportive team are more likely to be motivated to contribute their best efforts to the ship's operations.

5. **Safety and Security (Intrinsic and Extrinsic):** A well-maintained and safe working environment motivates crew members to perform tasks with diligence, knowing that their well-being is a priority.

**Example:** Knowing that the ship follows proper safety protocols and has well-maintained equipment encourages crew members to carry out their duties with confidence.

- 6) What is personal power and positional power? Explain how will you as a chief officer, motivate your crew keeping a balance between the two?

### Personal Power

- Comes from your character, competence, and relationships.
- It's informal, earned through respect, trust, and influence.
- Examples: mentoring juniors, showing empathy, demonstrating technical skill, being approachable.
- Crew follow you because they *want to*, not just because they *have to*.

### Positional Power

- Comes from your rank and authority as Chief Officer.
- It's formal, granted by the company and regulations.
- Examples: assigning duties, enforcing safety rules, approving leave, conducting drills.
- Crew comply because of hierarchy and obligation.

## To motivate my crew by keeping a balance between the two as a Chief Officer

A good leader doesn't rely solely on positional authority (which can feel rigid or authoritarian), nor only on personal influence (which may lack structure). The balance is key:

### 1. Use Positional Power for Structure

- Set clear expectations for safety, discipline, and operational standards.
- Ensure compliance with company policies and international regulations (SOLAS, ISM Code, etc.).
- Be firm when safety or critical operations are at stake—this shows authority is exercised responsibly.

### 2. Leverage Personal Power for Motivation

- Lead by example: show competence during drills and maintenance.
- Recognize achievements publicly—praise a junior officer for a well-prepared checklist.
- Mentor crew members, guiding them in career development.
- Listen actively to concerns and show empathy when personal issues arise.

## TEAM WORKING SKILLS

7) How as a Chief Officer on a Chemical tanker with hectic work schedule, will you prevent fatigue to the crew members? (6 times)

### Following things to be done to prevent fatigue to the crew members with hectic work schedule:

- Determine operational workload and required competencies and match manning levels and support resources.
- Manage workload, hours of work and rest.
- Understand and safeguard tasks where fatigue could increase mistakes.
- Consider the scheduling of SCTs or duties to avoid times when people may be less alert due to fatigue.
- Train personnel in the causes and effects of fatigue.
- Ensure there is sufficient opportunity to rest when planning work.
- Maintain a healthy exercise, nutrition and stress-aware environment.
- Monitor fatigue symptoms.
- Investigate fatigue-related causes of accidents and incidents.
- Consider suspending complex or extended operations to make sure that people, especially those most heavily involved, get enough rest.

(OR, AND)

#### 1. Work-Rest Compliance

- Strictly enforce **STCW rest hour requirements** (minimum 10 hours in 24, 77 hours in 7 days).
- Monitor rest hour records honestly—avoid “paper compliance.”
- Adjust watch schedules to minimize consecutive night duties.

#### 2. Task Planning & Delegation

- Plan cargo operations, tank cleaning, and maintenance with realistic timelines.
- Delegate tasks fairly among officers and ratings to avoid overloading individuals.
- Use checklists and PMS to spread work evenly across the voyage.

#### 3. Operational Efficiency

- Combine tasks where possible (e.g., inspections during cargo watch).
- Avoid unnecessary overtime—prioritize safety-critical work over cosmetic tasks.
- Coordinate with Master and company to prevent overlapping demands.

#### 4. Crew Welfare

- Encourage proper rest in cabins—quiet environment, minimal disturbances.
- Promote healthy routines: balanced meals, hydration, and short breaks during long operations.
- Support recreational activities (games, movies, gym) to relieve stress.

#### 5. Leadership & Motivation

- Lead by example—show discipline in managing your own rest hours.
- Recognize crew efforts during demanding operations.
- Use **personal power** (respect, empathy) to motivate, while **positional power** ensures compliance with safety rules.
- Encourage crew to report fatigue without fear of blame.

### 8) What are the various signs, causes & effects of fatigue? (8 times)

#### Signs of fatigue are as follows:

##### (a) Physical Signs:

- Yawning frequently
- Heavy eyelids or difficulty keeping eyes open
- Slowed reflexes or reaction times
- Muscle weakness or tremors
- Generalized body fatigue or weakness
- Headaches or migraines

##### (b) Mental Signs:

- Difficulty concentrating or staying focused
- Impaired decision-making abilities
- Forgetfulness or memory lapses
- Reduced ability to process information
- Decreased alertness or awareness of surroundings

##### (c) Emotional Signs:

- Irritability or mood swings
- Increased emotional sensitivity
- Anxiety or restlessness
- Depression or feelings of sadness
- Reduced motivation or enthusiasm for tasks

##### (d) Behavioural Signs:

- Increased errors or mistakes in tasks
- Reduced attention to detail
- Slurred speech or difficulty articulating thoughts
- Microsleep episodes (brief periods of unintentional sleep)
- Decreased initiative or productivity
- Withdrawal from social interactions or communication

**(OR, AND)**

- (a) Physical signs: tired eyes, muscle weakness, stiff shoulders, whole-body tiredness, headaches, dizziness.
- (b) Mental signs: poor concentration, memory lapses, slower reaction times, confusion.
- (c) Emotional signs: irritability, impatience, lack of motivation, anxiety, depression.
- (d) Behavioural signs: reduced performance, mistakes in routine tasks, increased risk-taking, boredom.

**Causes of fatigue are as follows:**

- Fatigue can be caused by lack of sleep, poor quality sleep or being awake for too long.
- It can accumulate over time with unsociable working hours or shift patterns.
- Fatigue can be caused by a lack of staffing, poor adherence to work/rest periods and extended operations (for example, from lengthy river passages/port approaches/long loading operations/terminal operations at unsociable hours).
- Fatigue can be caused by High or low temperature extremes, or exposure to poor lighting, noise.

**Effects of fatigue are as follows:**

**On Health**

- Weakened immunity, slower recovery from illness.
- Worsening of chronic conditions (e.g., heart disease, diabetes).
- Increased risk of accidents due to impaired alertness.

**On Performance**

- Fatigued people are more likely to make mistakes due to mental and physical impairment.
- Reduced concentration, slower reaction times, poor decision-making.
- Lower productivity and efficiency.
- Higher likelihood of errors in safety-critical environments (e.g., ships, aviation, healthcare).

**On Emotional Well-being**

- Stress, irritability, low morale.
- Risk of burnout and long-term psychological strain.
- Additionally, a fatigued person may be a poor judge of their own level of fatigue or impairment.

9) What are the factors will you as a chief officer, consider while delegating various tasks to your subordinates? (3 times)

**1. Competence & Experience**

- Assess the skill level and prior experience of the officer or rating.
- Match tasks to their training—for example, assigning complex cargo calculations to a junior officer who has shown aptitude.
- Avoid overloading inexperienced crew with critical safety tasks without supervision.

**2. Workload & Fatigue**

- Consider current duty rosters and rest hours (STCW compliance).
- Avoid delegating to someone already fatigued from long cargo watches.
- Balance tasks fairly across the team to prevent burnout.

**3. Safety & Risk Level**

- High-risk tasks (e.g. cargo handling, enclosed space entry) require delegation to competent personnel with proper supervision.
- Routine tasks (e.g., deck maintenance, record-keeping) can be delegated more freely.
- Always ensure proper PPE and safety procedures are followed.

**4. Authority & Responsibility**

- Clarify the scope of responsibility—who reports to whom, and what decisions they can make.
- Ensure delegated authority matches the task (e.g., a junior officer can supervise tank cleaning but not approve cargo valve operations).

## 5. Training & Development

- Use delegation as a tool for mentoring.
- Assign tasks that stretch abilities but provide guidance—helping junior officers build confidence.
- Rotate responsibilities so everyone gains exposure to different shipboard operations.

## 6. Urgency & Time Sensitivity

- For urgent operations (e.g., emergency response), delegate to the most competent and available crew.
- For routine or long-term tasks, use delegation to train and develop less experienced members.

## 7. Crew Motivation & Morale

- Recognize individual strengths and interests—delegating tasks that align with them boosts morale.
- Show trust by giving responsibility, but also provide feedback and appreciation.
- Avoid favouritism—fair delegation maintains harmony.

## 10) What are the essential elements you will allocate while setting the priorities? (3 times)

### 1. Safety First

- Always place safety-critical tasks (cargo operations, enclosed space entry) at the top.
- Ensure compliance with SOLAS, ISM Code, and company safety management systems.
- Risk assessments guide which tasks cannot be delayed.

### 2. Regulatory & Company Requirements

- Allocate priority to tasks tied to statutory obligations (rest hours, drills, documentation).
- Ensure class and flag state requirements are met on time.
- Company policies (reporting, maintenance schedules) must be respected.

### 3. Operational Urgency

- Cargo operations (loading/discharge) and navigational duties take precedence due to time sensitivity.
- Emergencies or breakdowns override routine maintenance.
- Weather or port restrictions may shift priorities suddenly.

### 4. Crew Welfare & Fatigue Management

- Balance workload to prevent fatigue.
- Respect rest hours and allocate time for meals and recreation.
- Prioritize fair distribution of tasks to maintain morale.

### 5. Competence & Training

- Match tasks to crew skill levels.
- Allocate training opportunities within routine work (e.g., cadets assisting in cargo log entries).
- Prioritize mentoring tasks that build junior officers' confidence.

### 6. Resource Availability

- Consider availability of manpower, equipment, and spare parts.
- Allocate priorities based on what can realistically be achieved with current resources.
- Avoid overcommitting when tools or manpower are limited.

### 7. Long-Term Maintenance & Reliability

- Preventive maintenance tasks should not be neglected in favour of short-term gains.
- Allocate priorities to critical systems (fire detection, cargo pumps, navigation equipment).
- Balance immediate operational needs with long-term reliability.

11) Explain Team work, Team building and interpersonal relationship with suitable examples in achieving its goals.

### Teamwork

- **Definition:** The coordinated effort of individuals working together toward a common goal.
- **Key Idea:** Everyone contributes their skills to achieve tasks that no one could accomplish alone.
- **Example:** During a chemical cargo loading operation, deck officers, ratings, and the pumpman must work in sync—checking valve line-ups, monitoring manifold pressures, and recording cargo data. If one person fails, the whole operation is at risk.

### Team Building

- **Definition:** The process of developing trust, cooperation, and cohesion among team members.
- **Key Idea:** It's about creating unity and a sense of belonging, so the crew feels motivated and aligned.
- **Example:** Conducting regular safety drills not only trains the crew but also builds confidence in each other's abilities. A well-run fire drill shows that everyone can rely on their shipmates in an emergency.

### Interpersonal Relationships

- **Definition:** The way individuals interact, communicate, and build trust with one another.
- **Key Idea:** Strong relationships reduce conflict, improve morale, and foster respect.
- **Example:** A Chief Officer who listens to a junior officer's concerns about fatigue, and adjusts their watch schedule, strengthens trust. That officer will feel valued and more motivated to perform well.

12) Define: i) Authority ii) Assertiveness iii) Delegation

#### i) Authority

- **Definition:** The legitimate right to give orders, make decisions, and enforce obedience, usually derived from rank or position.
- **Shipboard Example:** As Chief Officer, you have the authority to assign cargo watch duties, enforce safety procedures, and approve maintenance schedules. Crew members comply because of your official position in the hierarchy.

#### ii) Assertiveness

- **Definition:** The ability to express one's views, needs, or decisions confidently and respectfully, without being aggressive or passive.
- **Shipboard Example:** During a cargo operation, if a junior officer overlooks a valve lineup, you assertively correct them—firmly but respectfully—ensuring safety without demoralizing them. Assertiveness builds clarity and prevents misunderstandings.

#### iii) Delegation

- **Definition:** The process of assigning responsibility and authority to subordinates to carry out specific tasks, while retaining overall accountability.
- **Shipboard Example:** You delegate routine tank inspections to a junior officer, giving them responsibility for execution, but you remain accountable for ensuring the inspection meets company and regulatory standards.

## RESOURCE MANAGEMENT

13) Explain the basic principles of effective resource management. (2 times)

### 1. Clear Goals and Strategic Alignment

- Define **organizational objectives** and ensure resources support them.
- Every allocation should tie directly to project priorities and long-term strategy.

### 2. Strategic Planning

- Develop a **resource plan** that covers timelines, budgets, and availability.
- Use a **Resource Breakdown Structure (RBS)** to map out all required inputs.

### 3. Skill-Based Allocation

- Match tasks to people with the **right expertise**.
- Avoid mismatches that lead to delays, rework, or stress.

### 4. Optimization and Efficiency

- Continuously assess workloads to prevent **overallocation** and burnout.
- Apply **resource leveling** to balance tasks across the team.

### 5. Collaboration and Communication

- Maintain transparent communication between managers, teams, and stakeholders.
- Use tools like responsibility assignment matrices to clarify roles.

### 6. Flexibility and Adaptability

- Be ready to adjust allocations when project requirements or priorities shift.
- Build contingency plans for resource dependencies.

### 7. Continuous Monitoring

- Track **KPIs** such as utilization rates, costs, and productivity.
- Use visual tools like **resource histograms** to spot imbalances early.

### 8. Skills Development

- Invest in training and mentorship to enhance resource capabilities.
- Stronger skills reduce reliance on external hires and improve resilience.

### 9. Risk Management

- Identify bottlenecks, conflicts, or single-resource dependencies.
- Diversify resource sources and prepare backup options.

### 10. Continuous Improvement

- Capture lessons learned and refine processes over time.
- Encourage feedback loops to improve allocation strategies.

14) Discuss management of resources and personal with regards to prioritization, fatigue control, communication and leadership.

### 1. Prioritization

- Focus resources on the most critical tasks first, ensuring safety and mission objectives are not compromised.
- Use a **priority matrix** (urgent vs. important) to allocate manpower and equipment.
- Apply **risk-based thinking**: tasks with higher safety or operational impact get precedence.
- Regularly reassess priorities as conditions change (weather, operational tempo, emergencies).

## 2. Fatigue Control

- Human performance is a finite resource; fatigue undermines safety, decision-making, and efficiency.
- Implement **work-rest cycles** that comply with regulatory standards (e.g., STCW rest hours at sea).
- Rotate personnel on demanding tasks to avoid overburdening individuals.
- Encourage reporting of fatigue without stigma—crew must feel safe to raise concerns.
- Monitor signs of fatigue (slowed reactions, errors, irritability) and intervene early.

## 3. Communication

- Clear, consistent communication ensures resources are used effectively and personnel remain aligned.
- Use **closed-loop communication** (sender confirms message received and understood).
- Maintain **transparent reporting channels**—everyone knows who to inform and when.
- Standardize language and terminology to avoid ambiguity (especially in multinational crews).
- Encourage **feedback loops**: leaders listen actively, crew share concerns, adjustments are made.

## 4. Leadership

- Leadership sets the tone for resource use, morale, and operational discipline.
- Lead by example—demonstrate respect for rest hours, prioritization, and communication protocols.
- Empower crew: delegate responsibility with clear authority, fostering ownership of tasks.
- Balance **directive leadership** (in emergencies) with **participative leadership** (in routine operations).
- Recognize achievements and provide constructive feedback to maintain motivation.

## EFFECTIVE COMMUNICATION

15) List out some barriers to effective communication on board. Explain with onboard situation. (5 times)

### 1. Language and Cultural Differences

- Barrier: Multinational crews often speak different native languages, leading to misunderstandings.
- Situation: During a fire drill, the officer instructs “close the fire damper,” but a crew member with limited English mistakes it for “open the fire damper,” delaying the response.

### 2. Noise and Physical Environment

- Barrier: Machinery noise, alarms, and weather conditions can drown out verbal instructions.
- Situation: In the engine room, the chief engineer shouts instructions over the roar of generators, but the motorman mishears the order, resulting in incorrect valve operation.

### 3. Hierarchical Barriers

- Barrier: Junior crew may hesitate to question or clarify instructions from senior officers.
- Situation: A cadet notices a potential error in cargo securing but remains silent, fearing reprimand. The mistake later causes cargo shift in rough seas.

### 4. Fatigue and Stress

- Barrier: Tired crew members may not process information accurately.
- Situation: After long hours of watchkeeping, a fatigued officer misinterprets a VHF call from another vessel, leading to confusion in collision avoidance manoeuvres.

### 5. Ambiguity and Lack of Standardization

- Barrier: Using non-standard terms or vague instructions creates uncertainty.
- Situation: A bosun tells the deckhands to “tighten the ropes,” but without specifying which mooring lines, the crew focuses on the wrong set, delaying departure.

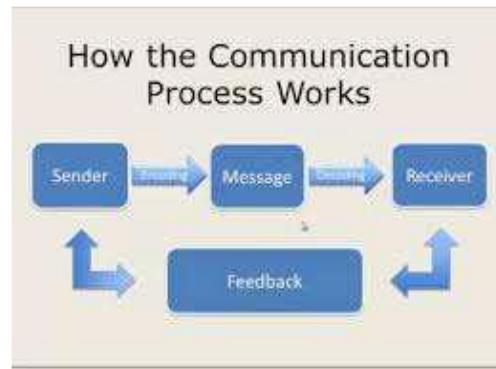
## 6. Technology and Equipment Issues

- **Barrier:** Faulty radios, poor internet, or outdated communication systems hinder clarity.
- **Situation:** During bunkering, the handheld radio fails, forcing crew to rely on hand signals, which are misinterpreted, risking a spill.

## 7. Information Overload

- **Barrier:** Too much information at once overwhelms crew members.
- **Situation:** During an emergency muster, the officer bombards the crew with multiple instructions simultaneously, causing confusion about which action to prioritize.

16) Explain with the help of block diagram method of effective communication on a ship. (2 times)



### 1. Sender (Source)

The person who initiates the message. Example: Captain, Chief Officer, or Duty Officer.

### 2. Encoding

The sender converts the idea into a clear message (spoken, written, or signals). Example: Giving a helm order like "Port 10" or writing instructions in the logbook.

### 3. Channel (Medium)

The means through which the message is transmitted. Onboard channels include: VHF/UHF radios, Sound-powered telephones, Hand signals, Alarms and bells, Written orders

### 4. Decoding

The receiver interprets and understands the message. Example: Helmsman understands "Port 10" as turning the wheel 10° to port.

### 5. Receiver

The person or group who receives the message. Example: Helmsman, engine room staff, deck crew.

### 6. Feedback

The receiver confirms understanding, which is critical in maritime operations. Example: Helmsman repeats: "Port 10, Sir" and executes the order.

**17) Explain different types of communication.**

Communication, very broadly, is classified into the following two categories:

- (a) Formal communication
- (b) Informal communication

**(A) Formal communication**

Formal communication is that, which takes place in an enterprise, in a formal manner via the scalar chain or the line of command.

There are three types of formal communication:

- (1) Downward communication
- (2) Upward communication
- (3) Sideward (or horizontal) communication

**(1) Downward Communication:**

- Downward communication moves downwards in an organisation, from the top management to middle and lower-level management travelling via various links in the scalar chain.
- Such communication is imperative for organisational purposes.
- Mostly it consists of communicating plans and policies of the enterprise to lower-level managers.
- And in particular, for issuing orders and instructions to subordinates.

**(2) Upward Communication:**

- This type of formal communication is feedback to downward communication.
- Upward communication proceeds upwards in an organisation from the lower-level management to middle and upper levels of management, travelling via various links, in the scalar chain.
- Upward communication, usually, takes the following forms:
  - (i) Reports by subordinates to superiors on work-performance
  - (ii) Grievances, problems or difficulties of subordinates forwarded to superiors, at appropriate levels.
  - (iii) Suggestions and ideas of subordinates to upper management, for kind consideration and appropriate implementation.
  - (iv) Clarifications sought by subordinates from superiors as to the orders and instructions issued by the latter (i.e. superiors).

**(3) Sideward (Or Horizontal) Communication:**

- This type of formal communication takes place among managers, placed at the same rank, in the organisation.
- It is necessary for achieving coordination of actions of individuals, doing the similar type of work, under managers of equal ranks.
- For example, communication between two assistant production managers is an instance of horizontal communication.

**(B) Informal communication**

- Informal communication, also called grapevine communication, takes place through informal groups, existing inside or outside the formal organizational structure.
- This communication has no formal manner of routing.
- It might spread from any person to any person, in any manner and any direction, like the structuring of a grapevine.

**18)** As a Chief Officer on board how will you motivate your team members using effective communication skills to get work done on board? Illustrate with on board situations.

### **1. Clear Instructions with Purpose**

Method: Explain not just what needs to be done, but why it matters.

Onboard Situation: Before mooring, you brief the deck crew: "Securing these lines properly ensures the ship doesn't surge alongside. It protects both the vessel and your safety." Crew feels their work is meaningful, not just routine.

### **2. Positive Reinforcement**

Method: Acknowledge good performance publicly, correct mistakes privately.

Onboard Situation: After a successful fire drill, you tell the team: "Excellent response time today—our readiness is improving because of your effort." It builds pride and motivation to maintain standards.

### **3. Closed-Loop Communication**

Method: Encourage crew to repeat back instructions to confirm understanding.

Onboard Situation: During cargo operations, you say: "Open No. 2 manifold valve." Bosun replies: "Opening No. 2 manifold valve, Chief." This reinforces clarity, reduces errors, and builds confidence.

### **4. Empowerment Through Delegation**

Method: Assign responsibilities with trust, not micromanagement.

Onboard Situation: You tell the cadet: "You'll lead the team in checking lifeboat equipment today. Report findings to me." Cadet feels valued, motivated to perform well.

### **5. Active Listening and Feedback**

Method: Show genuine interest in crew concerns.

Onboard Situation: A motorman reports fatigue during night watch. You respond: "Thank you for raising this. We'll adjust the watch rotation to balance rest hours." Crew sees leadership cares about wellbeing, boosting morale.

### **6. Encouraging Team Spirit**

Method: Use inclusive language and emphasize collective success.

Onboard Situation: After completing a heavy maintenance job, you say: "Well done, team. This was tough, but together we kept the ship safe and operational." This reinforces unity and shared responsibility.

### **7. Recognition and Appreciation through Communication**

Method: Use verbal acknowledgment and appreciation to highlight crew contributions, reinforcing that their efforts are valued.

Onboard Situation: After completing a heavy deck maintenance job, you gather the team and say: "Your hard work today kept the deck safe and operational. I appreciate the effort each of you put in—this is exactly what keeps the ship running smoothly." Crew feels recognized, morale rises, and motivation to maintain performance increases.

## LEADERSHIP AND MANAGERIAL SKILLS

**19)** “Personal Power & Situational Awareness helps in maintaining cordial environment on board for routine jobs”. Justify the statement with onboard situation. (4 times)

### **Personal Power (Confidence, Authority, and Respect)**

Personal power is not about rank alone—it’s about the ability to influence positively through confidence, fairness, and respect.

Onboard Situation: During mooring operations, the Chief Officer gives instructions calmly and clearly, showing confidence but also respect for the bosun’s experience. The bosun feels valued, follows instructions willingly, and motivates the deckhands to cooperate. This prevents tension and ensures smooth teamwork.

### **Situational Awareness (Understanding the Environment and Risks)**

Situational awareness is the ability to perceive what is happening around you, anticipate potential issues, and adjust communication accordingly.

Onboard Situation: While conducting hot work on deck, the Chief Officer notices rising wind and nearby fuel transfer. He immediately halts the job, explains the risk, and reschedules. Crew appreciates the foresight, trusts leadership, and remains cooperative because safety was prioritized over routine completion.

**20)** “Using different Situational Leadership Styles contributes to effective bridge team work”. Justify this statement with on board situations. (2 times)

### **1. Directive Style (Telling)**

- When Used: Emergencies or high-risk situations where immediate compliance is critical.

- Onboard Situation: During a collision avoidance manoeuvre, the Master orders: “Helmsman, hard to starboard—now!”. Clear, direct command ensures immediate action without delay.

### **2. Coaching Style (Selling)**

- When Used: When crew needs guidance but also motivation to understand the importance of tasks.

- Onboard Situation: Before entering a busy traffic separation scheme, the Chief Officer explains: “We’ll maintain a sharp lookout. This area is congested, so your vigilance is vital for safe passage.” Crew understands both the task and its significance, boosting alertness.

### **3. Participative Style (Consulting)**

- When Used: Routine operations where input from the team improves efficiency and morale.

- Onboard Situation: While 2nd Officer is planning a route for the upcoming voyage, the Master participate & provide the input. Officer feels involved, increasing engagement and ownership.

### **4. Delegative Style (Empowering)**

- When Used: When crew are competent and experienced, allowing autonomy.

- Onboard Situation: During routine coastal navigation, the Master tells the 3/O: “You have the con. Keep me updated on CPA with nearby vessels.” Builds trust, develops junior officers’ confidence, and strengthens teamwork.

**21)** List out the essential Leadership and Managerial Skills required for a Chief Officer onboard the ship. (3 times)

### Essential Leadership Skills

1. **Decision-Making Under Pressure:** Ability to make quick, sound judgments during emergencies (e.g., collision avoidance, fire response).
2. **Motivational Communication:** Inspiring crew through clear instructions, encouragement, and recognition.
3. **Conflict Resolution:** Handling disputes among multinational crew members with fairness and diplomacy.
4. **Situational Leadership:** Adapting style—directive in emergencies, participative in routine operations.
5. **Team Building:** Creating unity and trust among diverse crew members through inclusive practices.
6. **Emotional Intelligence:** Understanding crew stress, fatigue, and morale to maintain harmony onboard.

### Essential Managerial Skills

1. **Planning and Organization:** Scheduling maintenance, drills, and cargo operations effectively.
2. **Resource Management:** Allocating manpower, tools, and time efficiently to avoid overwork and delays.
3. **Compliance and Documentation:** Ensuring ISM Code, SOLAS, MARPOL, and class requirements are met with proper records.
4. **Delegation:** Assigning tasks to competent crew members while maintaining accountability.
5. **Monitoring and Evaluation:** Tracking performance, safety drills, and operational readiness.
6. **Risk Assessment:** Identifying hazards in routine jobs (e.g., mooring, bunkering) and implementing preventive measures.

**22)** As a Ch/off explain the areas you would concentrate to be an effective Leader & increase the efficiency of crew. Explain with the help of onboard situation (5 times)

Write Answer Same as Ques No. 18

**Q)** As a chief officer how and when will you use “Situational Leadership” to get effective work done from your team members?

Similar answer from Q. 20

**Q)** “Chief officer needs to have good leadership and managerial skills”. Justify this statement with onboard situation.

Similar answer from Q. 21

**23)** What are the most important values one must demonstrate as a Leader? How can a leader fail? Give an example of a situation when you failed as a Leader. (2 times)

### Most Important Values a Leader Must Demonstrate

- **Integrity:** Be honest and consistent; crew must trust your word.
- **Fairness:** Treat all crew equally regardless of rank, culture, or background.
- **Accountability:** Own decisions and outcomes, whether successful or not.
- **Respect:** Show dignity in communication; respect builds loyalty.
- **Empathy:** Understand fatigue, stress, and personal challenges of crew.
- **Decisiveness:** Make timely, clear decisions, especially in emergencies.
- **Adaptability:** Adjust leadership style to suit the situation and crew capability.

## How a Leader Can Fail

- Poor Communication: Instructions misunderstood, leading to errors.
- Ignoring Crew Welfare: Fatigue or stress overlooked, reducing efficiency.
- Micromanagement: Crew feels undervalued, morale drops.
- Failure to Listen: Missing valuable input from experienced seafarers.
- Lack of Accountability: Blaming crew instead of owning mistakes erodes trust.

## Example of Leadership Failure (Onboard Situation)

As Chief Officer, I once scheduled a heavy deck maintenance job immediately after a long cargo operation. I gave instructions clearly but failed to consider crew fatigue.

What Happened:

- Crew carried out the job but worked slowly, made mistakes, and morale dropped.
- One AB later admitted he was too tired to focus, which could have led to an accident.

Why It Was a Failure:

I demonstrated decisiveness and authority but lacked empathy and situational awareness. By not adjusting the plan to allow rest, I failed as a leader in that moment.

## 24) Explain human error & how can it be minimized? (2 times)

An unintended action or decision that leads a task or system beyond acceptable limits.

It can be of various types:

- Slips (execution errors): Doing something incorrectly (e.g., pressing the wrong button).
- Lapses (memory failures): Forgetting a step in a procedure.
- Mistakes (planning errors): Choosing the wrong course of action due to mis judgment.

## Causes of Human Error Onboard

- Fatigue and overwork (common in long voyages).
- Poor communication between multinational crew members.
- Unclear or complex procedures without standardization.
- Stress and time pressure during cargo operations or emergencies.
- Distractions from alarms, noise, or multitasking.

## To Minimize Human Error

- Training and Knowledge: Regular drills and refresher courses ensure crew understand procedures. Example: Conducting weekly safety drills reduces mistakes during real emergencies.
- Standard Operating Procedures (SOPs): Use checklists for routine jobs (mooring, bunkering, cargo ops). Example: A mooring checklist prevents crew from forgetting to secure spring lines.
- Fatigue Management: Enforce rest hours under STCW regulations. Example: Adjusting watch schedules to prevent drowsy officers on the bridge.
- Error-Proofing Systems: Design equipment and procedures to minimize mistakes (e.g., color-coded valves). Example: Using distinct markings on ballast valves prevents accidental wrong operation.
- Closed-Loop Communication: Orders repeated back to confirm understanding. Example: Helmsman repeats "Hard to starboard" to avoid misinterpretation.
- Just Culture: Encourage reporting of near-misses without punishment. Example: An AB reports almost slipping during deck work, leading to improved PPE enforcement.
- Monitoring and Feedback: Regular audits and performance reviews highlight weak areas. Example: Reviewing cargo operation logs to identify recurring errors.