

SHIP CONSTRUCTION , SHIP SAFETY & ENVIRONMENT PROTECTION



2nd Mate written notes
Question wise

By : Anupam Singh Rajput

 : SMART MARINER (Please subscribe)

IF YOU HAVE ANY SUGGESTION FOR
ME, PLEASE EMAIL IT TO:

anupamsinghrajput8084@gmail.com

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Q NO 3

- SHIP CONSTRUCTION(SKETCH & LABEL)



Q NO 7

- SHIP CONSTRUCTION THEORY



Q NO 4

- MARPOL/BALLAST WATER MANAGEMENT



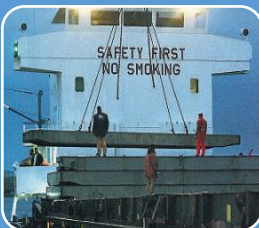
Q NO 8

- MARITIME LEGISLATION(SOLAS/ISPS/ISM)



Q NO 9

- LEADERSHIP AND TEAM WORKING SKILLS



Q NO 5,6

- SHIP SAFETY/ENVIRONMENT PROTECTION
- PRECAUTIONS/CHECKLISTS



Q. 3. SHIP CONSTRUCTION (SKETCH AND LABEL)

P-131 (1) Sketch and label water cooled stern tube

P-131, 132 (2) Sketch and label a neat diagram of forepeak tank. Explain how the parting and pounding stresses are counteracted.

P-132 (b) Sketch and label parting arrangement in forward part of the ship

P-132 & 133 (3) (a) Draw a sketch of aft peak tank showing various parting & pounding arrangement. (b) Sketch & label a side profile view of transom stern showing the (propeller & semi-balanced rudder) the stern frame.

P-134 (4) Sketch & describe various types of rudders and illustrate their salient features.

P-135 (5) Draw & label a longitudinally framed DB tank. State the uses & benefits of DB tank.

P-136, 137 (6) Describe various types of framing system on merchant ships.

P-137, 138 (7) Sketch & label a hatch corner, showing the strengthening arrangement. Explain how the strength is compensated.

(8) Sketch & label a midship section of

P-138 (a) longitudinally framed self trimming bulk carrier.

P-139 (b) compositely framed bulk carrier with hopper tank? what is self trimming hold?

P-140 (c) of double hull oil tanker/large crude carrier (d) LNG tanker

P-141 (e) DBO carrier (f) container vessel

P-142 (9) Draw a neat sketch and label Bilge & ballast piping on-board ship.

Q. 7. SHIP CONSTRUCTION THEORY

P-144, 145, 146 (1) Explain the following feature in ship construction & their purpose (a) Sheer (b) Camber (c) Flare (d) Tumblehome (e) Rise of floor (f) Stress & strain (g) LBP (h) Freeboard (i) Deck line

P-146, 147, 148 (2) (a) Explain the various stresses experienced by ships structural members which compensate for same. (b) Describe the diff. b/w parting & pounding. what structural arrangement are provided to withstand these stresses.

P-148 (3) Describe floors, beams, brackets & girder.

P-148, 149, 150 (4) Write short notes on (a) Garboard strake (b) Sheer strake (c) stringer plate (d) Stealer plate (e) Gusset plate

P-150, 151, 152 (5) Sketch and describe (a) Beam knees (b) Bilge keel (c) Flat plate keel (d) Strum box (e) Chain locker (f) Corrugated bulkhead (g) Transom floor.

P-152, 153 (6) Describe the following terms with suitable sketch as applicable (a) Rake of propeller (b) Propeller skew (c) Propeller boss (d) Pitch

P-153 (7) Define (a) Rake of stem (b) Rake of keel (c) Margin line (d) Load displacement (e) TPC (f) FWA.

P-154 (8) What is Angle of Loll? How will you determine that the vessel is at Angle of Loll? How do you go about correcting angle of Loll?

P-155 (9) Draw load lines of cargo ship.

Q.4. MARPOL/BALLAST WATER MANAGEMENT

- P-157 (1) Explain what all information are available in SOPEP? (OR) (4 times)
Explain the purpose & context of SOPEP. (5 times)
- P-158 (2) Write a short note on SMPEP.
- P-158, 159 (3) Describe oil record book (8 times)
- P-159 (4) Write short notes on cargo record book.
- P-160 (5) Write short note on (OR) Explain the purpose or context of
 (a) Garbage management plan (b) Garbage record book (c) VRR
- P-161 (6) Define the following as per MARPOL 73/78 :-
 (a) Emission control areas (b) Special areas (c) Nearest Land
- P-162 (7) (a) What are special areas as per Annex I & II of MARPOL 73/78?
 (b) What are special areas as per Annex IV & V of MARPOL 73/78?
- P-163 (8) What are discharge criteria of oil or oily mixture from cargo space of an oil tanker as per Annex I of MARPOL 73/78?
- P-163, 164 (9) (a) Describe the various cargo categories under Annex II of MARPOL 73/78?
 (b) What are the discharge criteria as per Annex II of MARPOL 73/78?
- P-165 (10) What are the discharge criteria as per Annex IV of MARPOL 73/78?
- P-165 (11) (a) What are the discharge criteria for disposal of garbage at sea as per Annex V of MARPOL?
 (b) List the different categories of cargo as per MARPOL Annex V?
- P-166 (12) Describe the controls on emissions of SOx & NOx as per Annex VI of MARPOL 73/78?
- P-166, 167 (13) With the help of suitable diagram, explain the working of sewage treatment plant.
- P-168 (14) (a) What is the relevance of BW convention in marine environment protection?
 (b) As per BWM convention, describe the exchange criteria of ballast water
 (c) Explain the D1 and D2 standards of ballast water management.
- P-169, 170 (15) What are the different methods of ballast exchange & precautions during such operation.

Q.8. MARITIME LEGISLATION (SOLAS/ISPS/ISM)

- P-172 (1) Explain the role of classification societies in marine industry (6 times)
- P-172-10 (2) With respect to UNCLOS, define the following:
 174 (a) Base line (b) Territorial water (c) Contiguous zone (d) EEZ (11 times)
 (e) Continental shelf (f) Right to innocent passage.
- P-174, 175 (3) Write short notes on "Hour of rest" as per STCW 2010. (6 times)
- P-175 (4) List 10 statutory certificates to be carried out on a general cargo ship.
- ISPS P-176 (5) Describe the objective & functional requirements of ISPS code.
- P-176, 177 (6) Write briefly about DOS and CSR as per ISPS code.



- P-177,178 (7) State the different security levels as per the ISPS code and the actions as duty officer in port at each level
- ISM P-178 (8) What are the function and objective of ISM code
- P-179 } (9) @ what is safety management system under ISM code.
- } (b) What is the functional requirements of safety management system as per ISM code.
- P-179+181 (10) Explain the elements of ISM code
- P-181 (11) What is "Near miss" as per ISM code
- P-181,182 (12) Write briefly about DOC and SMC as per the ISM code.
- ISPS P-183 (13) Describe the content of ship security plan.
- MLC P-183,184 (14) Explain the content of five titles of MLC 2006
- P-184 (15) Enumerate the key requirement of MLC 2006
- P-185 (16) Write short notes on (a) OPA-90 (b) Civil liability convention (c) London dumping convention.
- P-186, 187 } (17) How will you assist co while preparing a vessel for (a) ISM audit
- } (b) ISPS audit (c) Loadline survey (d) SER survey

Q-9 Leadership and team working skills.

- P-188,189 (1) Define situational awareness. What are the six barriers to situational awareness.
- P-189,190 (2) Explain situational awareness while keeping bridge watch. How situational awareness reduces the possibility of human error. (9-times)
- P-190,191 (3) Explain effective communication & what are the tools for effective communication?
- P-191,192 (4) Do you agree it is beneficial to be passive rather than aggressive? Justify.
- P-192,193 (5) Explain the importance of management of (a) Fatigue (b) motivation.
- P-193 (6) How would you motivate & educate you crew on-board for safe operation.
- P-194 (7) Describe the essential qualities of team leader (10-times)
- P-194,195 (8) Define team work. What are the advantages of team work
- P-195,196 (9) What is meant by resource management? Explain the key element of effective resource management.

Q-5 SHIP SAFETY/ ENVIRONMENT PROTECTION

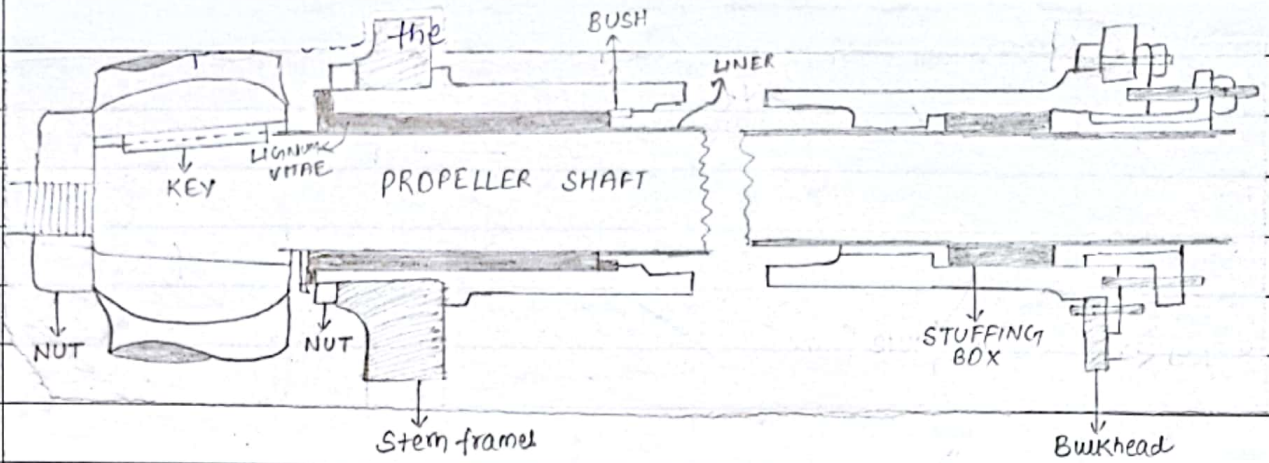
- P-198, 199 } (1-a) What is safety committee & what are its function?
- } b) what are the agenda for monthly safety meeting?
- P-199 (2) What are the duties of safety officer and safety representative on-board a vessel?
- P-200 (3) How the safety of ship personnel is ensured by permit to work system?
- P-200,201 (4) With respect to risk assessment, explain (i) Hazard (ii) Risk (iii) Competent person
- P-201 (5) Explain the need of a risk assessment on-board ship
- P-202 (6) Explain the various proactive measures to be taken to protect marine environment



Q(3) SHIP CONSTRUCTION (SKETCH & LABEL)

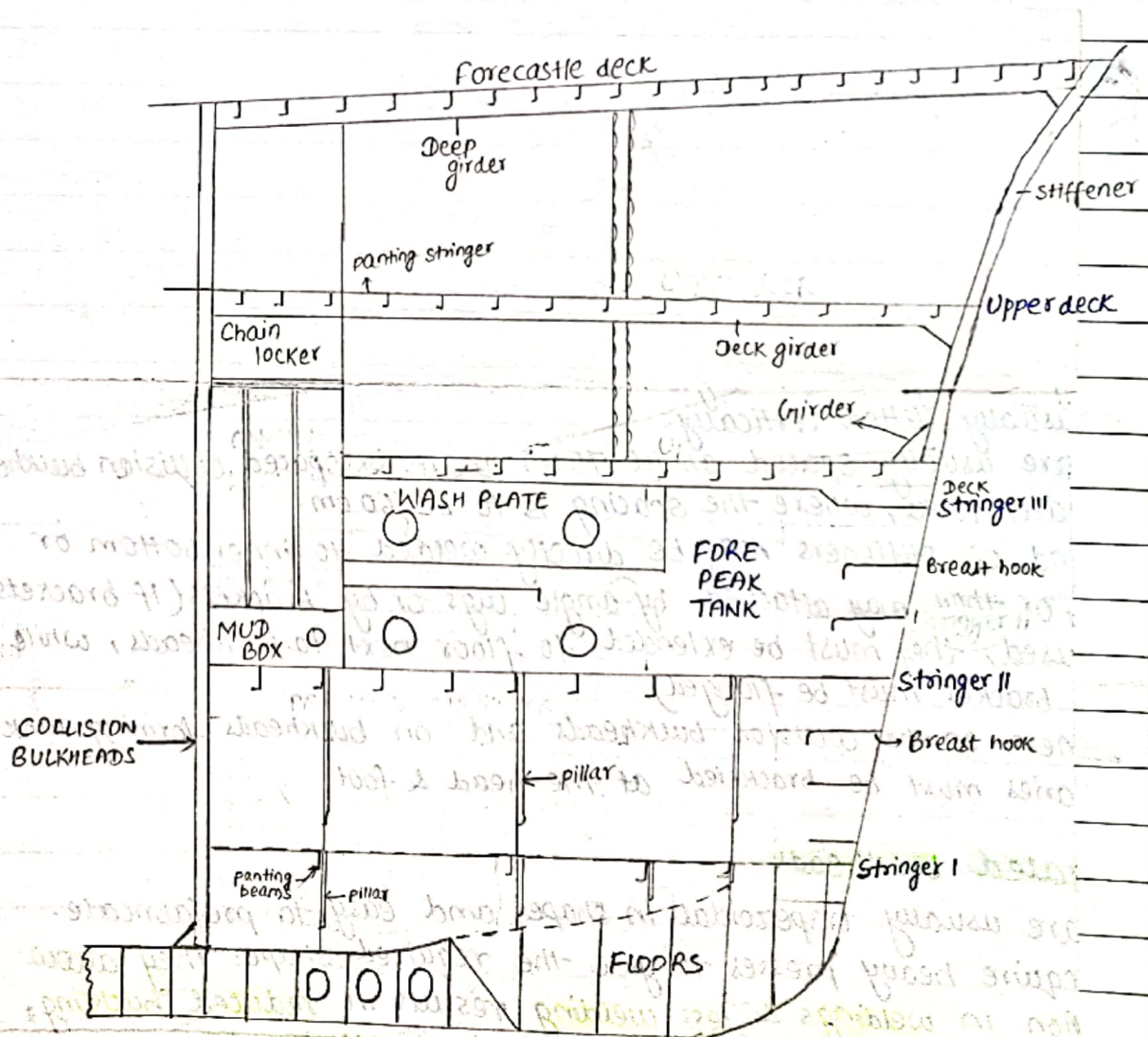
Ques ①:- Sketch and Label water cooled stern tube (4 times)

Ans:-



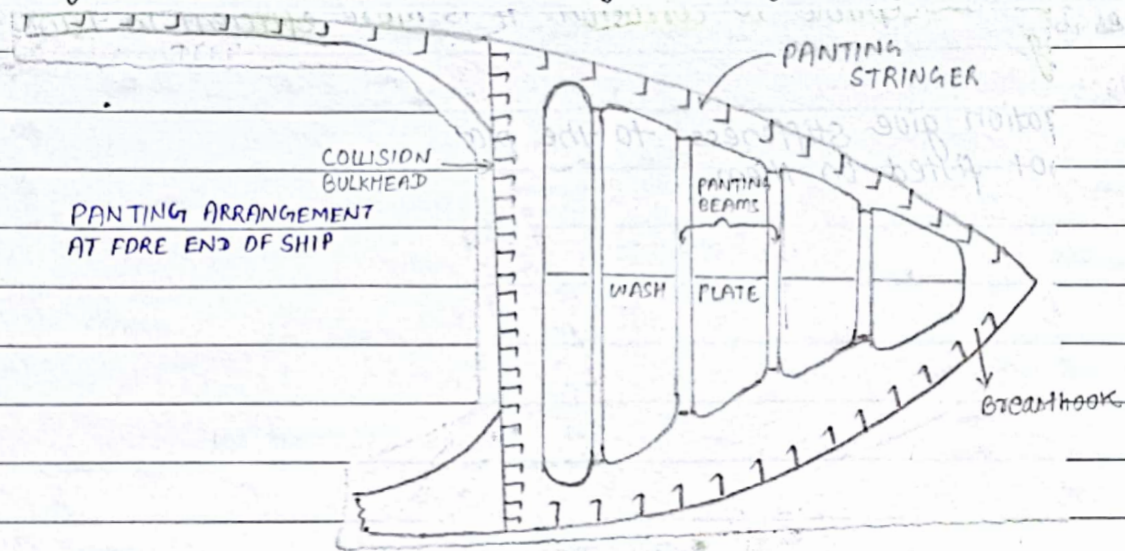
Ques ②:- Sketch & label a neat diagram off Fore Peak Tank. Explain how the panting and pounding stresses are counteracted. (7 times)

Ans:-



Sketch & Label panting arrangements in the forward part of the ship.

Panting stresses are counteracted by following arrangements:-



- Tiers of panting beams are fitted forward of the collision bulkhead and below the decks & stringers to counteract the panting stress.
- Tiers of panting beams are spaced 2.0 metres apart vertically and must be supported by wash plates or pillars.
- Breasthooks are fitted at interval to stiffen the stem plate.

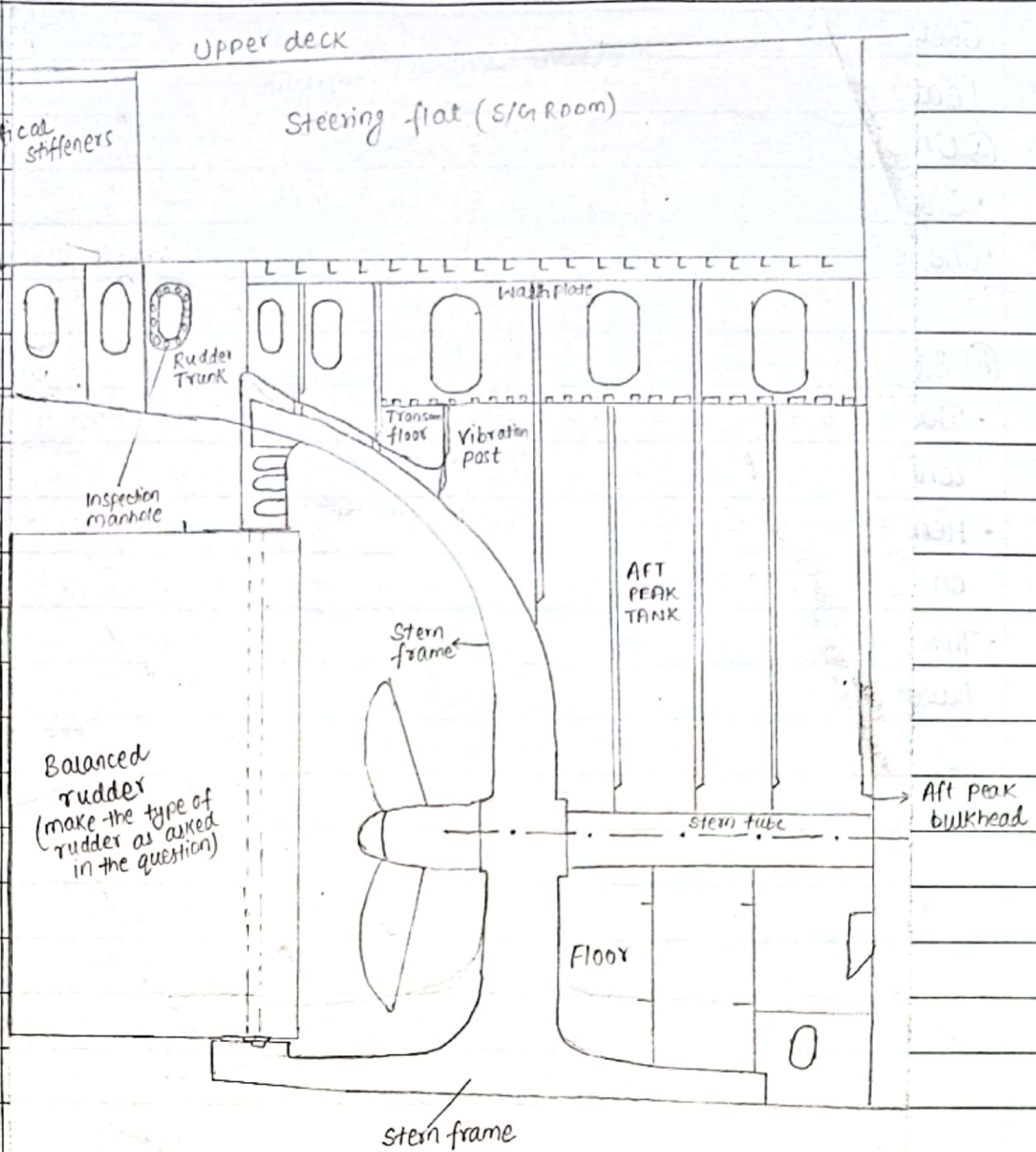
Pounding stress are counteracted by following arrangements:

- Solid plate are fitted at every frame space and are connected to outer bottom plating by continuous welds
- Center and side girders are extended forward to few floors to resist the distortion of bottom due to slamming.
- The flat bottom shell plating is increased in thickness by 15 to 30% depending on length of the ship. to resist the effect of pounding from collision bulkhead to 25% of ship's length from forward.

Ques ③) Draw a sketch of aft peak tank showing the various panting and pounding arrangements. Label all parts. (3 times)

Ans:-

See the
diagram in
next page



(3.b) If said, side profile view of a transom stern showing (the propeller and a semi balanced rudder) (2-times) (the stern frame) (4-times)

Same as above diagram, just add propeller & type of rudder said in the question.

* For the type of rudder, see next page

P.T.O

Take a deep breath,
you have much more to study.

ASR

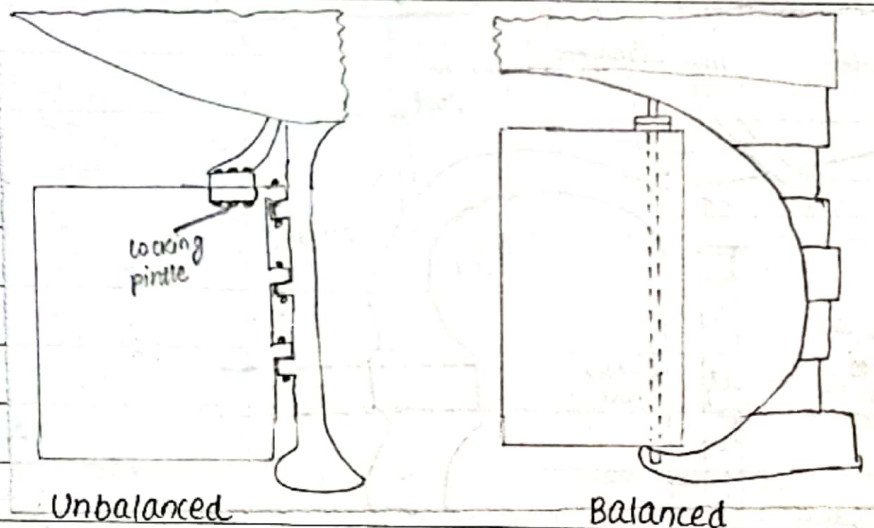
Q.4) Sketch and describe various types of rudder and illustrate their salient features.

Ans:- (a) Unbalanced rudder.

- This type is typically hung on the stern post.
- The whole part of the rudder is behind the stock i.e. rudder flote is fitted on pole.

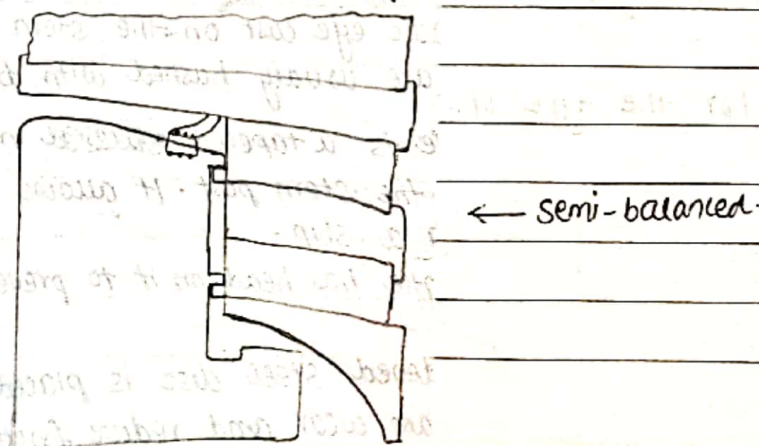
(b) Balanced rudder.

- Water pressure tries to force the blade of an unbalanced rudder amidship which causes stress on rudder stock & steering gear.
- Hence, part of the blade is extended forward of the stock, the pressure on this will counterbalance and there will be less stress on steering gear.
- This type of rudder are balanced for an angle of helm of 15 degrees and have about one quarter of their area forward of the stock.



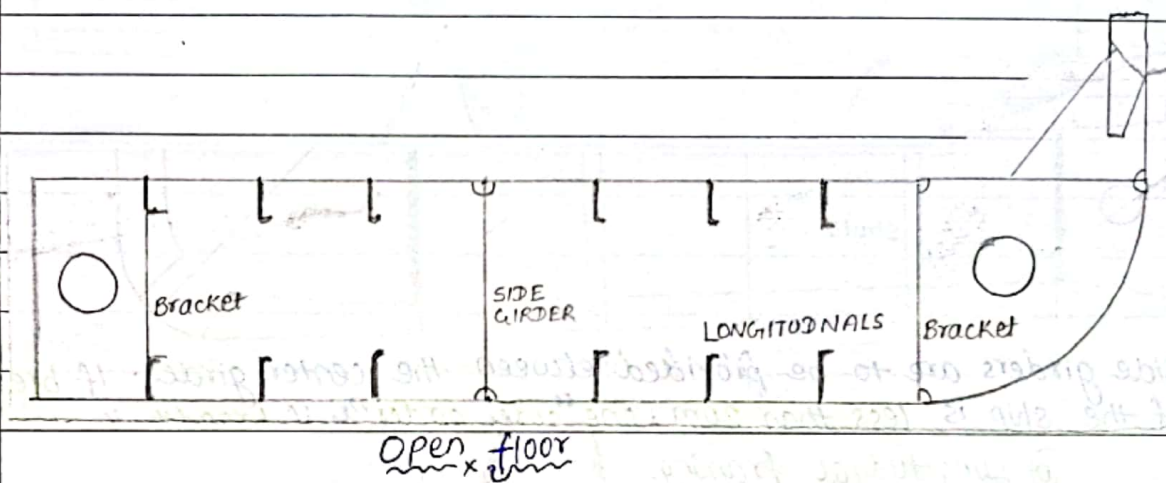
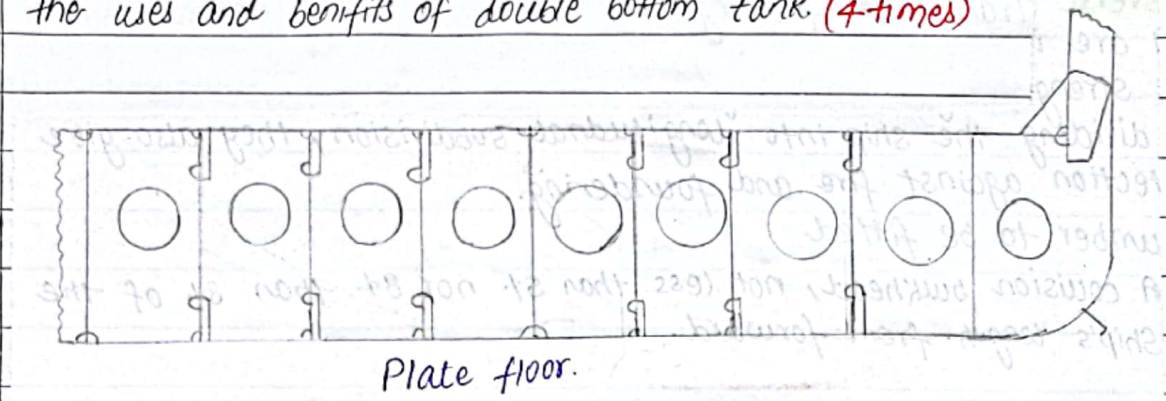
(c) Semi-balanced rudder.

- In this type, top portion of the rudder is hung on the stem post and the bottom portion is extended in front.



Q.5

Draw and label a longitudinally framed double bottom tank. State the uses and benefits of double bottom tank. (4-times)



- Double bottom of the ship is a safety feature to avoid ingress of water in case of grounding or collision.
- These bottom tanks are used to store ship ballast water to stabilize the ship.
- Double bottom tanks are also effective as a preventive measures in the reduction of marine pollution.
- In some ships such as container and bulk carrier, the double bottom space is divided transversely into three sections (instead of two). This is done to provide cofferdam in the centre known as duck keel which are used to carry ballast, bilges & bunker pipings & tank valves.
- It also helps to achieve minimum draft at which propeller^{can} (is) fully immersed in water (in) ^{during} lightship condition.
- It also used to correct list or trim of the vessel.

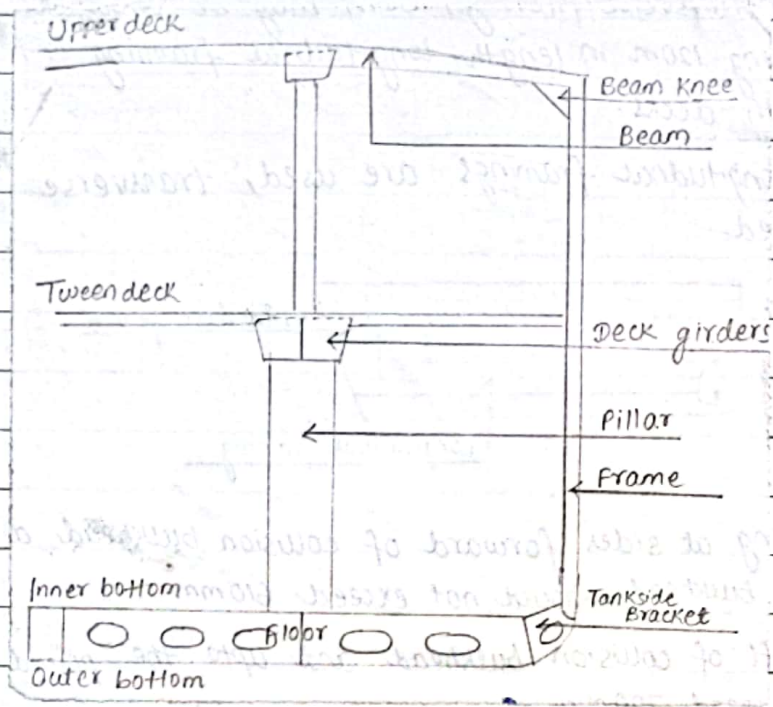


Q.6 Describe various types of framing system on merchant ships. (4 times)

Ans:- (a) Transverse framing.

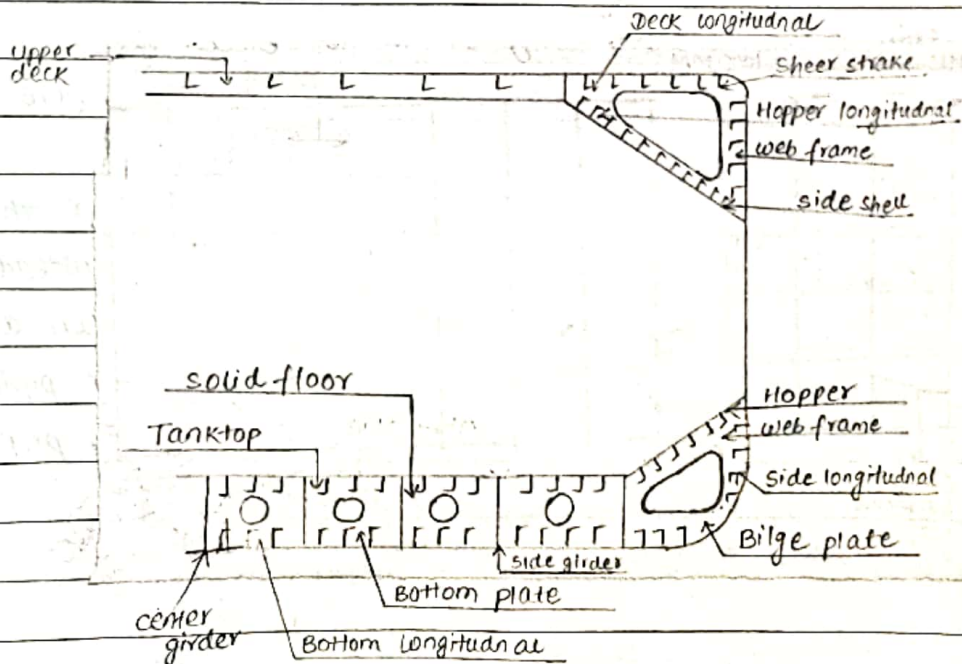
(mostly asked in Q. No. 7)

This framing was used for old sailing ships & general cargo ships with tween deck.



(b) Longitudinal framing.

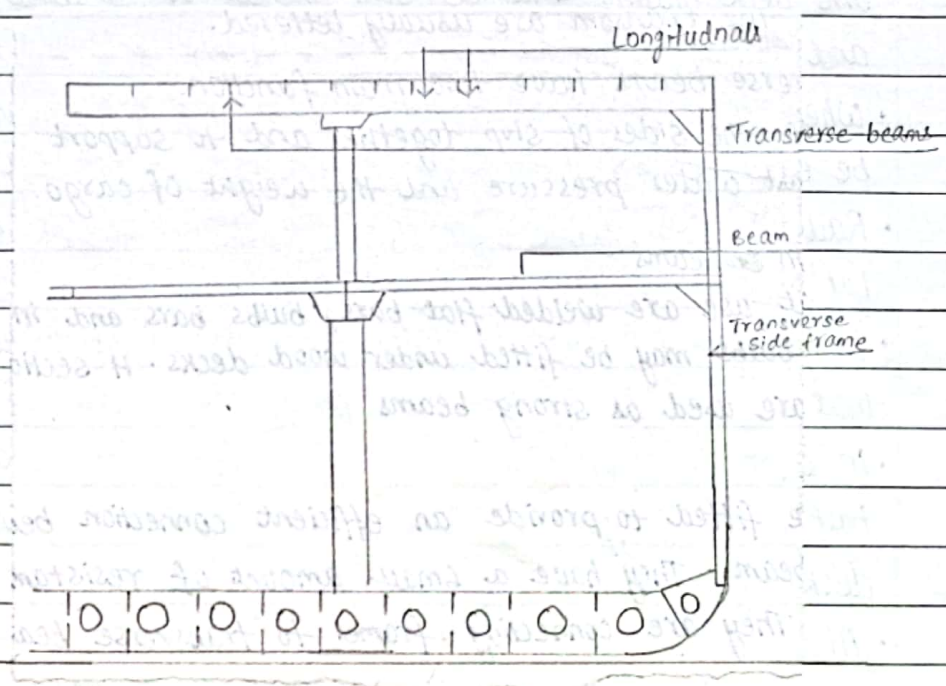
- Most of tankers are made using this framing.
- Vessels which are more than 120m in length will have longitudinal framing.
- Whenever longitudinal framings are used, transverse web frames are also used.





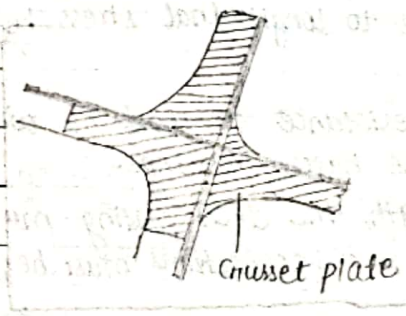
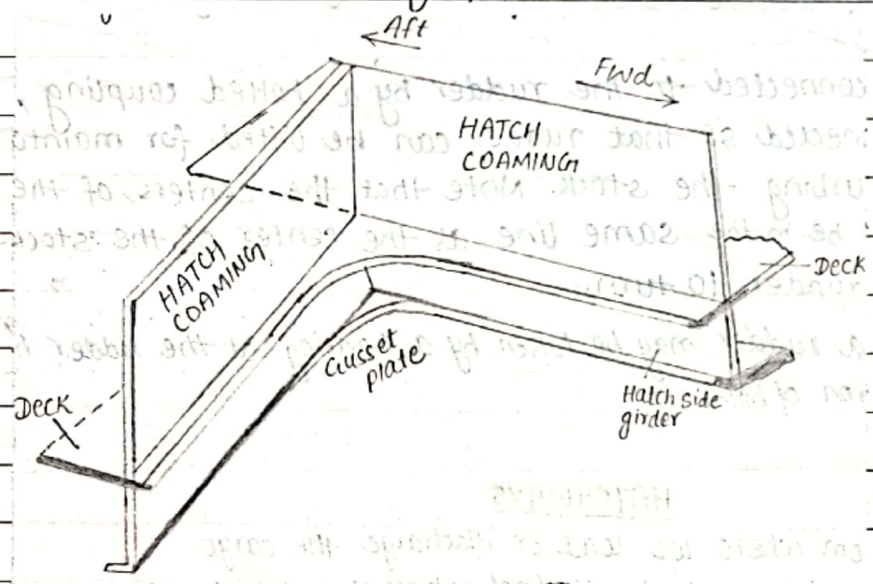
© Combination framing.

- Bulk carriers & general cargo ship uses this framing.



Ques (7) :- Sketch and label a hatch corner, showing the various strengthening arrangement. Also explain how the strength is compensated for the openings on the main deck in the way of hold.

Ans :-





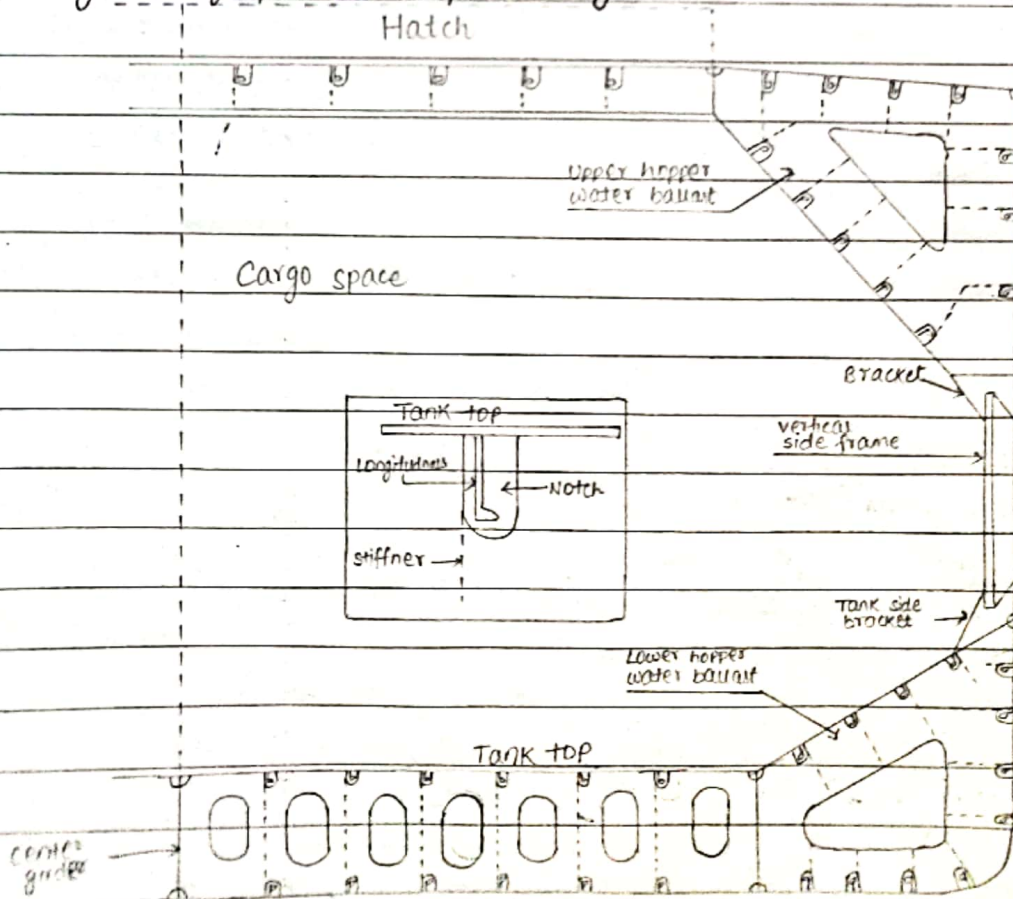
When hatchways (opening on main deck from where we load or disc. cargo) are there, the strength of deck is compensated by :-

- The deck plating must be strengthened or doubled, and the coaming and their connections must be sufficiently strong & rigid.
- When deck is welded, square corners are not allowed. The opening may be elliptical or parabolic, or corners may be rounded off.
- Radius at the corners must be atleast $\frac{1}{24}$ of the breadth of the opening, but not less than 300mm in any case.
- Coamings on weather deck must extended well above the deck, to ensure that water cannot enter the cargo hold.
- In addition to the plating, beams will also cut at hatchways. So, the end of half beams will be connected to the hatch coamings and supported by deck girders.
- At the end of the hatchways, hatch end beams will be fitted to support the coamings.

Q.8

MIDSHIP SECTION

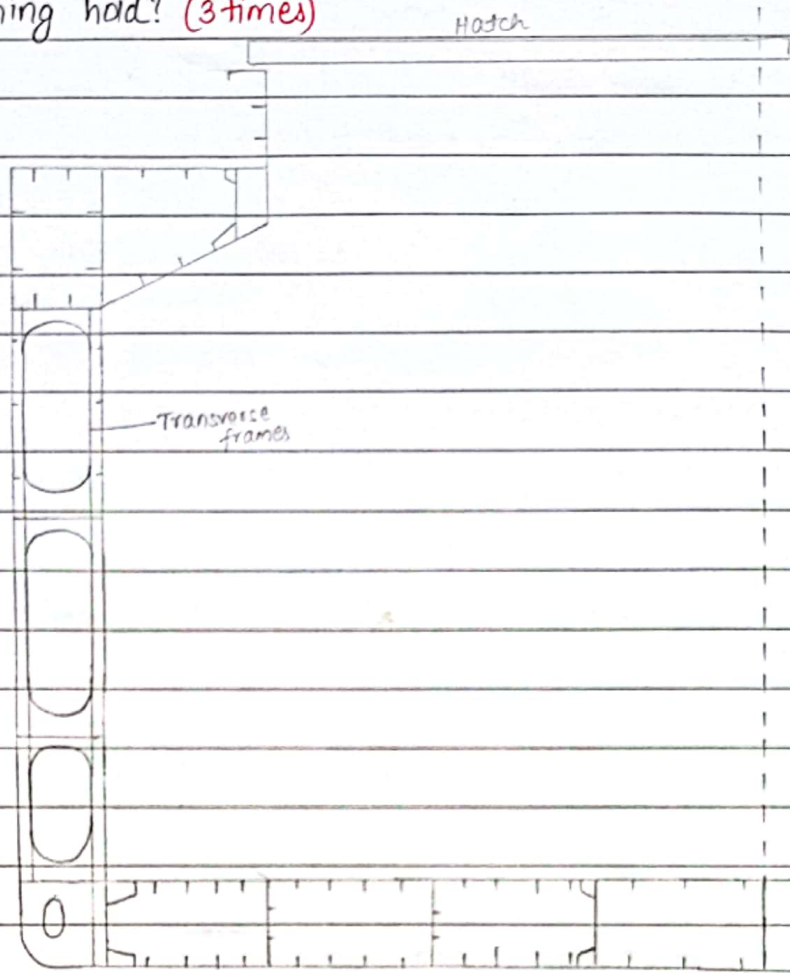
of longitudinally framed self trimming bulk carrier and label its parts (2-times)



Composite: combine (two or more images) to make a single picture.



(b) of compositely framed bulk carrier with hopper tanks. What is self trimming hold? (3 times)



In other half side draw same as (a)
bcz question said compositely that means combine two image

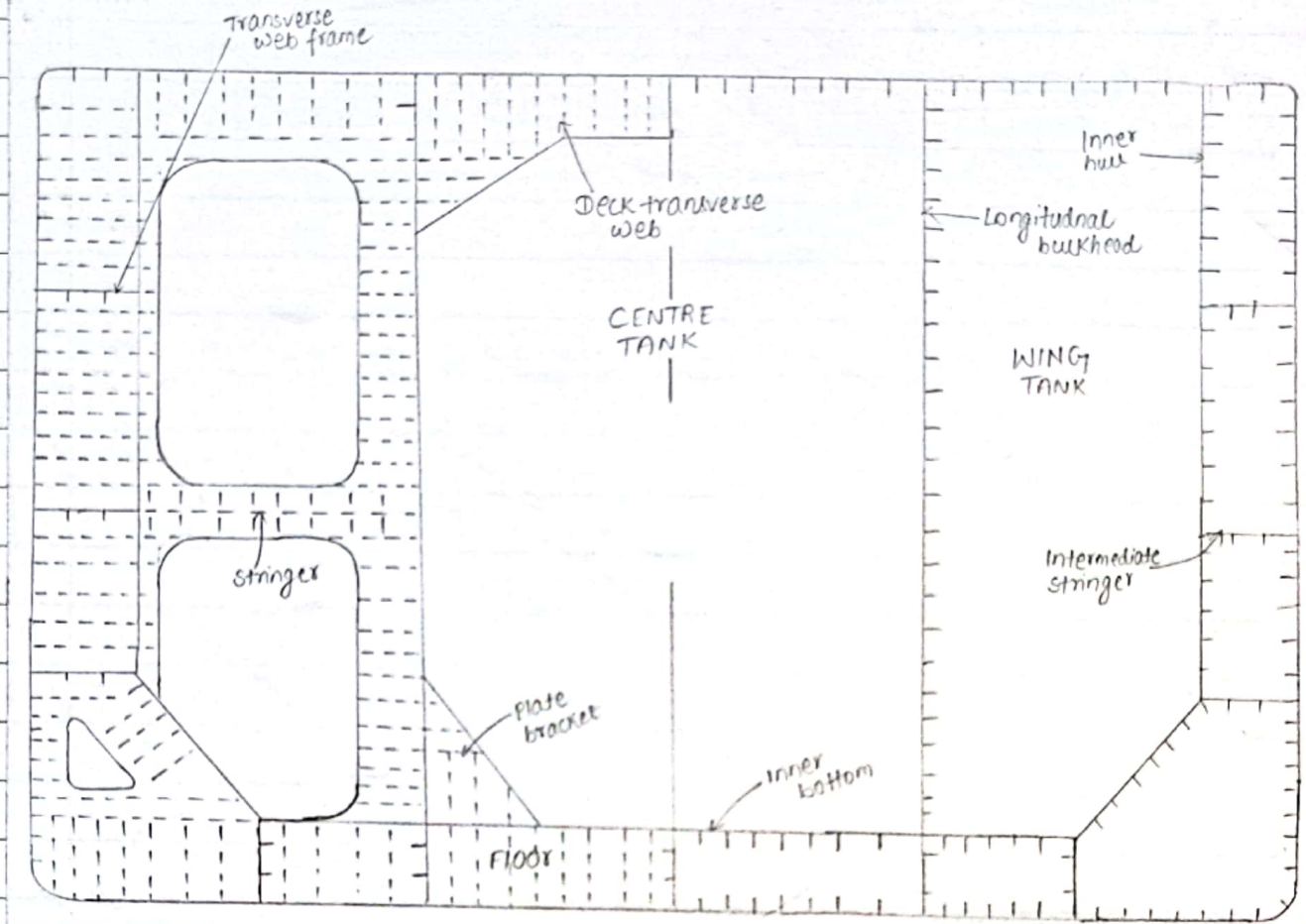
Self trimming hold

- It is so called because its design ensures that hatches are filled to 100% of capacity without trimming.
- It enables the loading of loose bulk cargoes directly into all parts of hold.

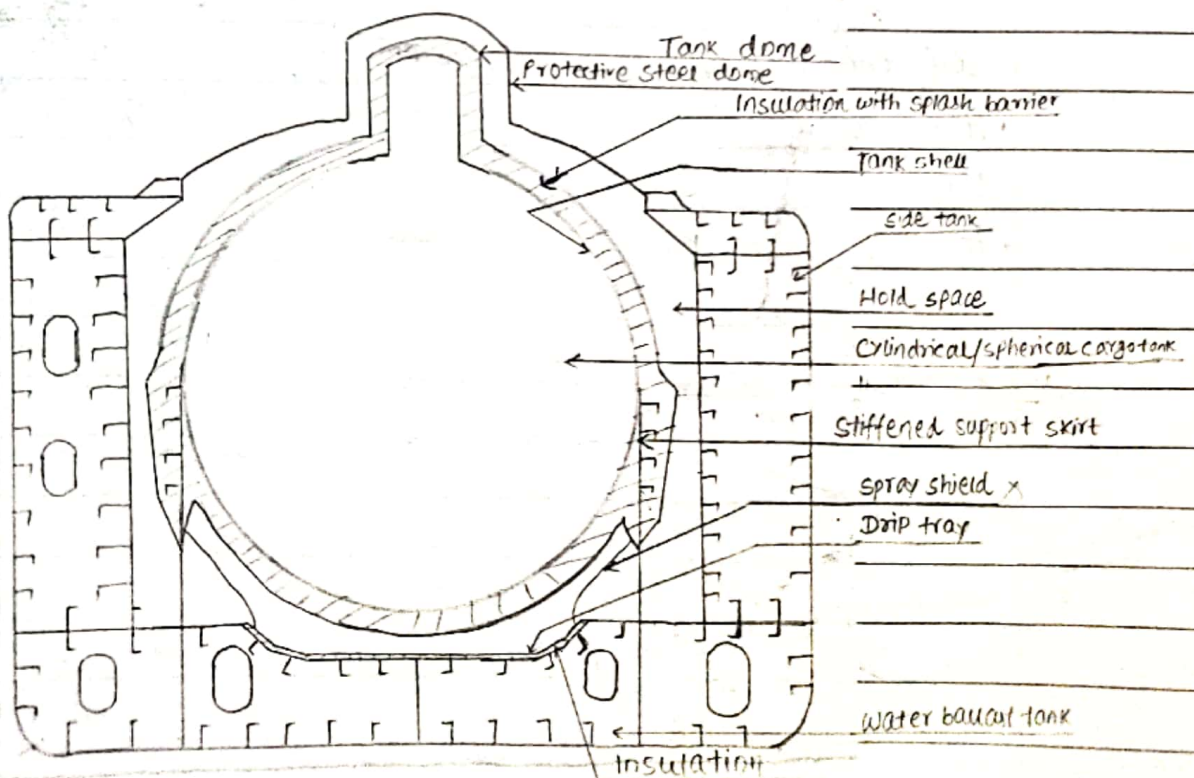
Like a grain cargo, it has a very small angle of repose less than 30° . So, if the hold is not completely full, the cargo will shift causing vessel to list.

So, the grain cargo are loaded upto nearly 100% of capacity, & there are small feeder holes provided, so that grain settles automatically into all parts of hold, that means it get self trimmed & thus any mishapen due to cargo shifting can be avoided. Hence, it is called self trimming.

© of double hull oil tanker/large crude carrier. (3 times)

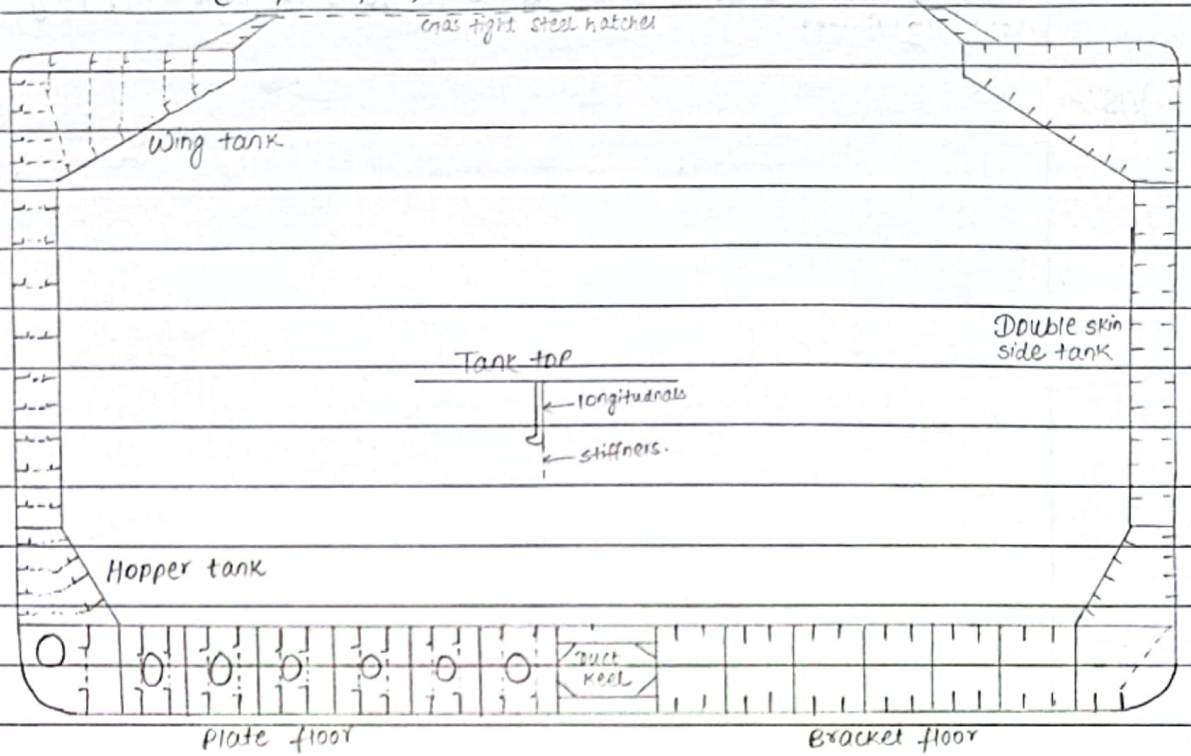


© of LNG tanker.

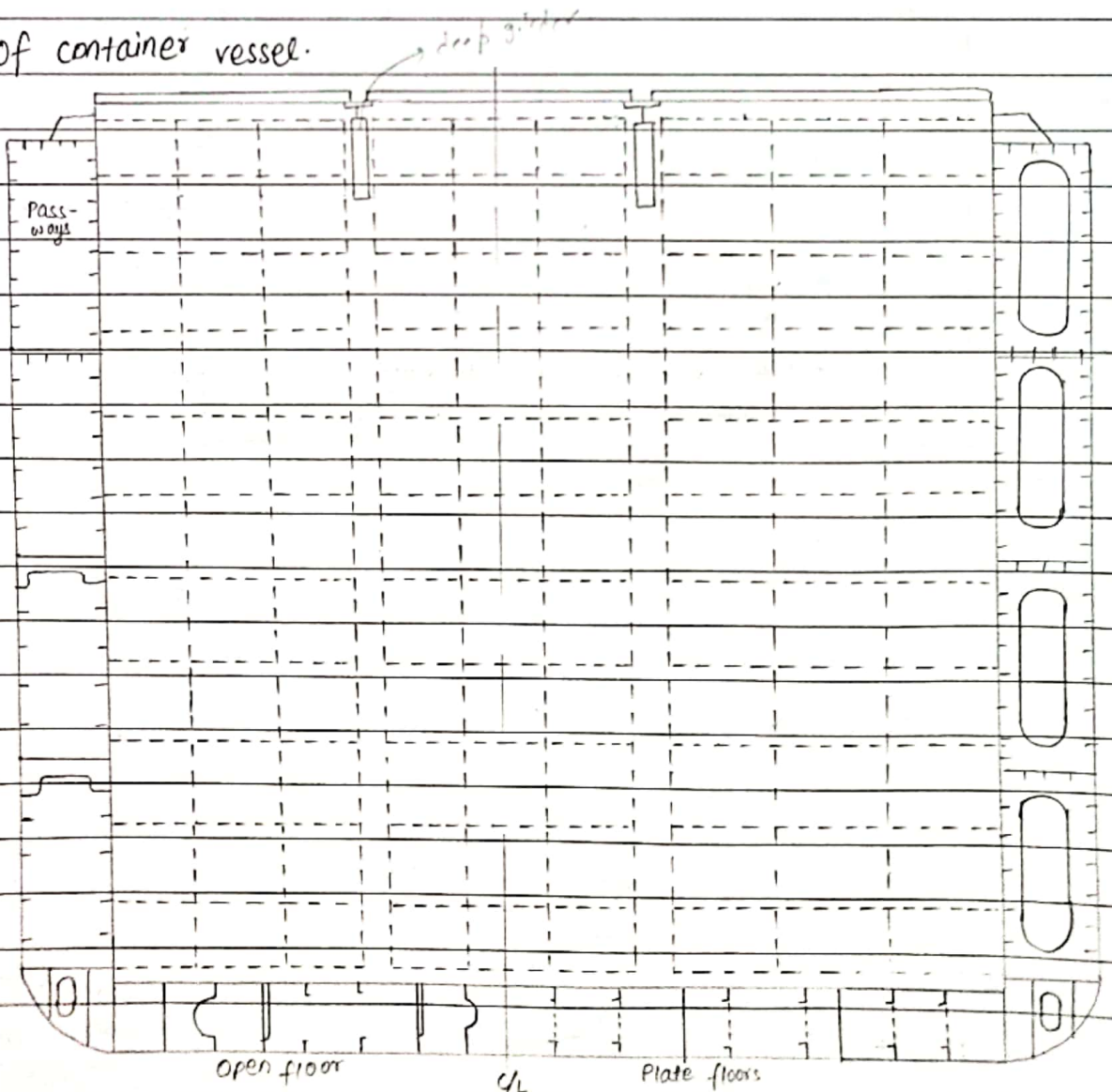




© of OBO carrier (ore/bulk/oil)



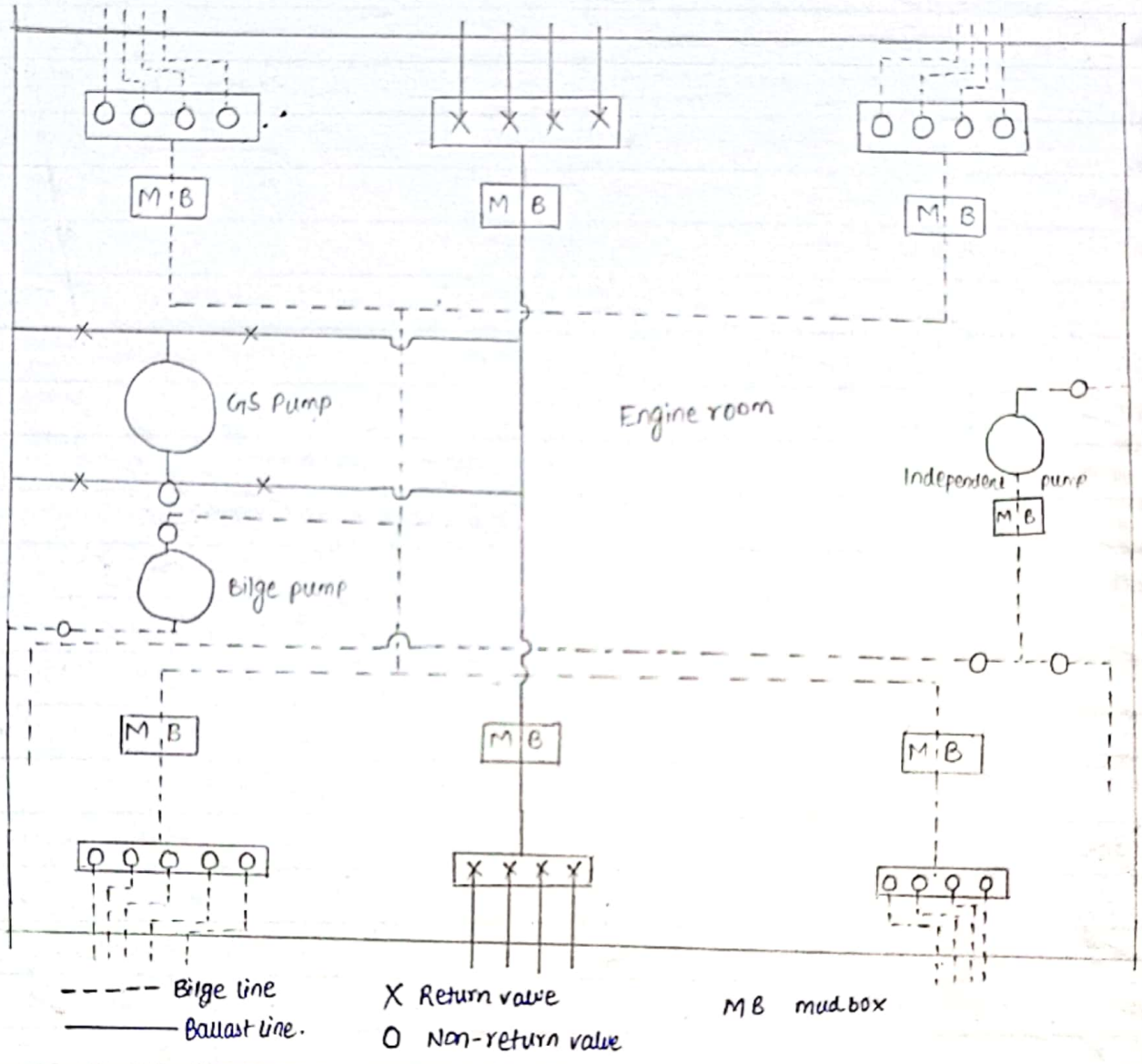
⊕ of container vessel.





Ques ③:- Draw a neat sketch and label Bilge and ballast piping on-board a Ship. (3 times)

Ans:-

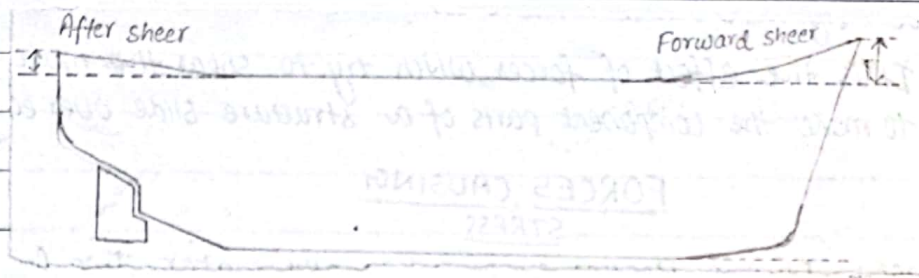


R 7 SHIP CONSTRUCTION THEORY

Q.1 Explain the following features in ship construction & their purpose.

*** (a) Sheer. (9 times)

- It is the rise of a ship's deck fore and aft.
- It add buoyancy to the ends where it most needed.



*** (b) Camber (11 times)

- It is the curvature of decks in the transverse direction.
- It helps to shed water from the deck & add to its longitudinal strength

(c) Flare (3 times)

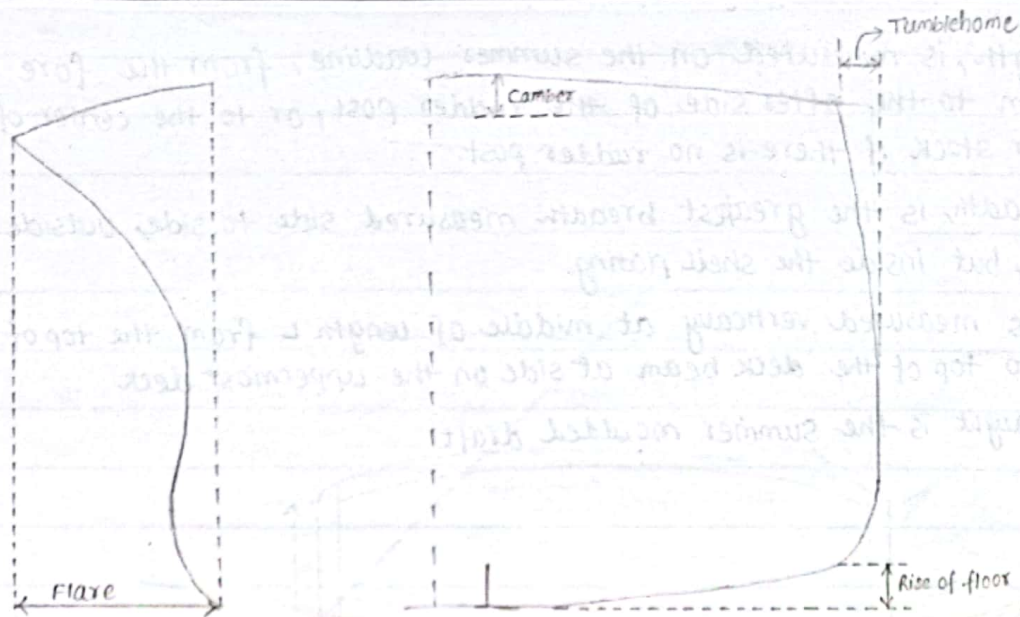
- It is the outward curvature of the hull above the waterline in the forward end of the ship.
- It increases buoyancy & provides a wider forecattle deck allowing anchors to drop clear of shell plating.

(d) Tumblehome.

- It is the inward curvature of the hull above the waterline in the after end of the ship
- Modern ship rarely have tumblehome.

(e) Rise of floor. (9 times)

- It is the rise of the bottom shell plating above the horizontal base line, measured at the ship's side.
- It allow liquid in the double bottom to drain to the centerline.



* This is a front view

* This is a view from stern
* This is not a side view

(f) Stress & strain

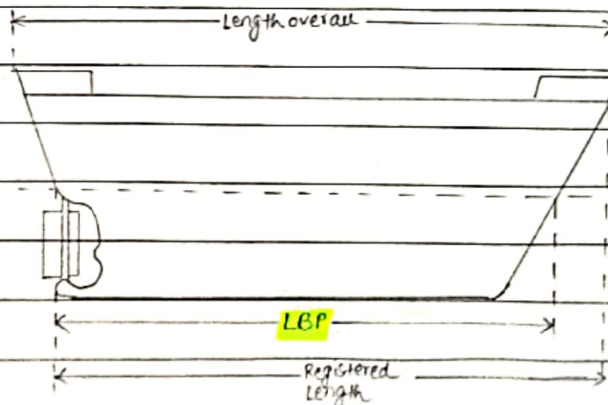
- **Stress** is a load acting per unit area on a hull structure. It is expressed in Kilogrammes per square millimeter (Kg/mm^2)
- If the stress is excessive, which may cause permanent deformation or weaken the structure is known as **strain**.

There are three types of stress:

- Tensile: try to pull the material apart.
- Compressive: try to crush the material.
- * Shear: It is the effect of forces which try to shear the material (or) make the component part of a structure slide over each other.

(g) LBP (2 times)

It is the length between the aft and forward perpendiculars measured along the summer load line.

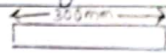


(h) Freeboard (2 times)

It is the distance measured from the waterline to the upper edge of the deck line.

(i) Deck line (3 times)

- It is a line from where freeboard is measured.
- It is drawn at midship where deck plate meets side shell plate.
- It is of size: 300mm by 25mm.



Q.2@ Explain the various stresses experienced by a ship and the structural members which compensate for the same? (4 times)

Ans: The stresses on ship's structure is divided in two categories:

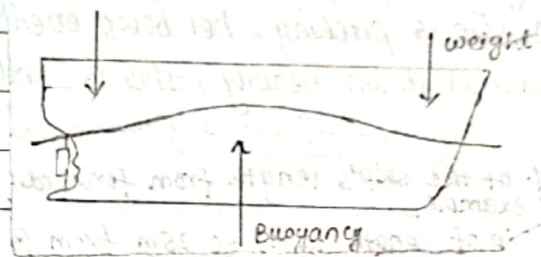
- Global
- Local

⇒ **Global Stresses.**

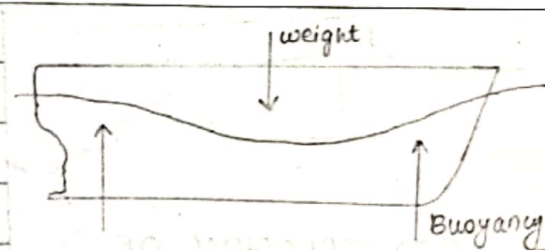
@ Hogging and sagging. (2 times)

These are longitudinal bending stresses, which may occur when ship is in seaway, or may be caused during loading.

→ When ship is loaded too much weight in ends, may cause her to hog.



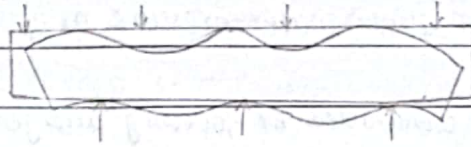
→ When ship is loaded too much weight in amidship, may cause her to sag.





(b) Shearing stress

This is also a longitudinal stress caused by the difference in weight and buoyancy distribution.



Deformation in girders

(a) & (b): Longitudinal stress

(c) Racking (6 times)

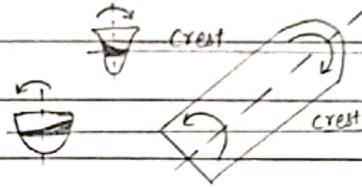
- Ship may be racked by wave action, or by rolling in seaway.
- The stress come mainly on the corners of the ship.
- Transverse bulkheads & web frames provide very great resistance to ship.

(c), (d) & (e): Transverse stress



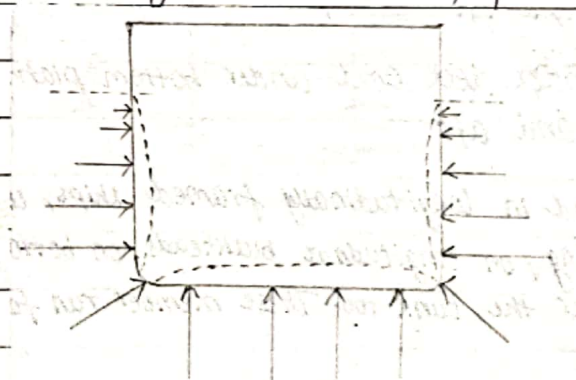
(d) Torsion (3 times)

- When a hull is subject to a twisting moment (torque), then the structure is said to be in 'torsion'.
- This effect mostly occurs with decks having large openings.



(e) Water pressure

- It tends to push the sides and bottom of ship.
- It is resisted by bulkheads and by frames & floors





(b) Describe the diff b/w pouting & pounding stresses. what structural arrangement are provided to withstand these stresses (5 times)

⇒ Local stresses

(a) Pouting. (4 times)

• Pouting is in/out motion of the plating in the bows of the ship and is caused due to unequal water pressure as the bow passes through successive waves.

(a) & (b):
localized stress

Pouting stresses are counteracted by following arrangement
see P-132

(b) Pounding.

• When ship is pitching, her bows even lifts clear of water and comes down heavily, this is known as pounding.

• 25% of the ship's length from forward is known as pounding region.

Pounding stresses are counteracted by following arrangement
see P-132

Q. (3) Describe floors, beams, brackets, (pillows) & girder.

Ans.: • Floors: It is found only in double bottom tank, run transversely.

• Beams: It is found under deck, run transversely.

• Brackets: It is found at the end of deck beam which connects beam and frame to the shell plating.

• It provide additional structural strength to the bulkhead.

• Girder: It is found at under deck and at under bottom plating, runs forward and aft.

Q. (4) Write short notes on:
Topic: shell & deck plating

(a) Garboard strake (2 times)

• The plates are arranged in fore and aft lines around the hull is called **strakes**

• For identification, first strake which is lettered and is adjacent to keel is known as '**Garboard strake**'

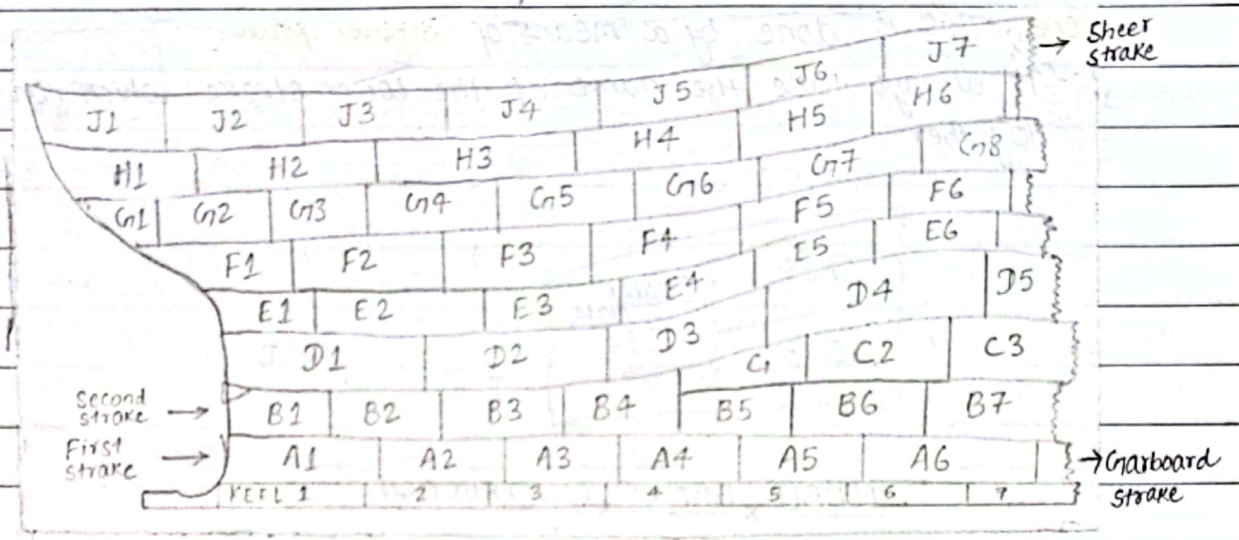
• The garboard strake is strake 'A'

(b) Sheer strake

• It is the uppermost strake of shell plating on either side, next to upper deck.

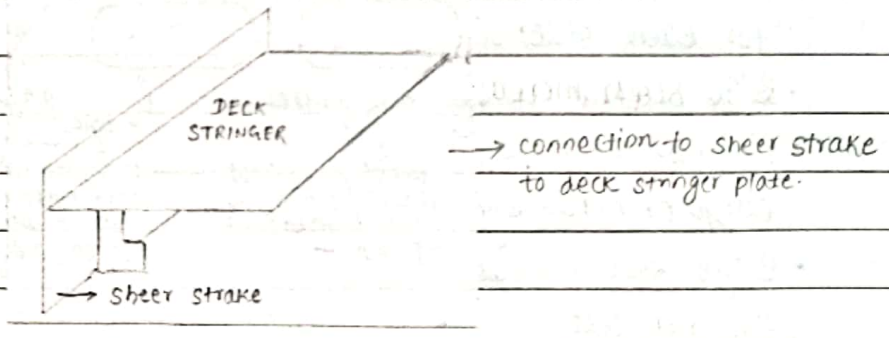


- The sheer strake is strake J (in below diagram)
- The upper edge of the sheer strake is kept smooth & free of any welded fittings or connection.
- Where the sheer strake is rounded, the radius should not be less than 15 times the thickness of the plate.



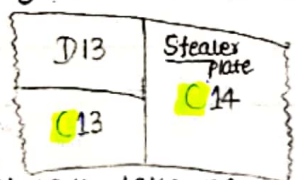
© Stringer plate

- It is the outboard strake of plating on any deck.
- Like deck stringer, it is the outboard strake of deck plating which is connected to the sheer strake.



(d) Stealer plate (3 times)

At the ends of the ship, particularly at the bow, the width of strake decreases and it often desirable to merge two strake into one. This is done by a means of stealer plate.



Note: It always take name of the lower strake which run together.



Q) Gusset plate (2 times)

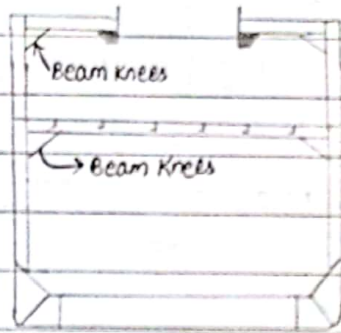
It is a triangular plate used for joining two or more adjacent structural member when they are intersecting each other.

see diagram in P-137

Qr5) Sketch and describe

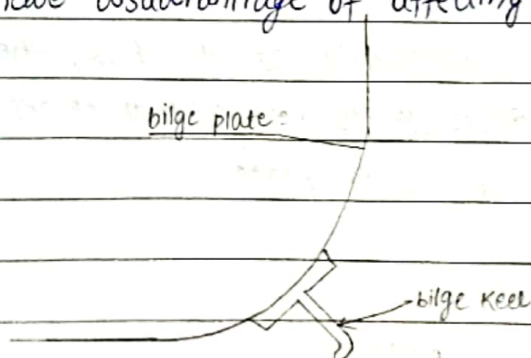
a) Beam knees (3 times)

- It is a triangular plate which is secured between beams and the side frames.
- It compensate for racking stresses and localised stresses from heavy weight.



b) Bilge keel (6 times)

- It is a longitudinal plate, like a fins, fitted externally in pairs (one for each side of the ship)
- It is often in a v shape, welded along the length of the ship.
- It does not have any component inside the hull which would affect cargo or machinery space
- Bilge keel increases hydrodynamic resistance to rolling, making the ship roll less.
- It have disadvantage of affecting the forward motion.

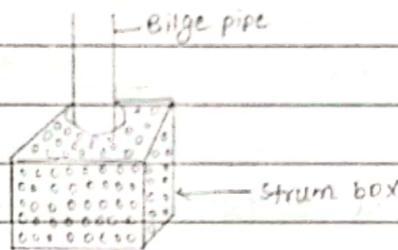


(c) Flat plate keel (3 times)

- It is located at the centreline of the bottom structure, often said to form the backbone of the ship.
- It provides the longitudinal strength to the ship.
- It also effectively distributes the local loading caused when docking the ship.
- If a double bottom is fitted, the keel is mostly of the flat plate type.

(d) Strum box (2 times)

- It is a perforated (pierced with a hole) metal box fitted around a bilge suction pipe opening, to prevent debris from choking the pipe.
- It prevents bits and pieces getting into your bilge pump and causing damage to the inner components.



(e) Chain locker.

- It is a compartment usually positioned forward of the collision bulkhead.
- It is used to accommodate the volume of chain cable attached to the each of the ship's anchors.
- Its maintenance is usually carried out when vessel is in drydock.

(f) Corrugated bulkhead.

- It is used as a bulkhead inside a cargo hold compartment for having easier maintenance, easier loading/unloading etc.
- It is trapezoidal in shape and easy to prefabricate.
- It allow reduction in welding, less welding result in reduced buckling (sudden deformation) & less susceptible to corrosion.
- Corrugation give stiffness to the plating.

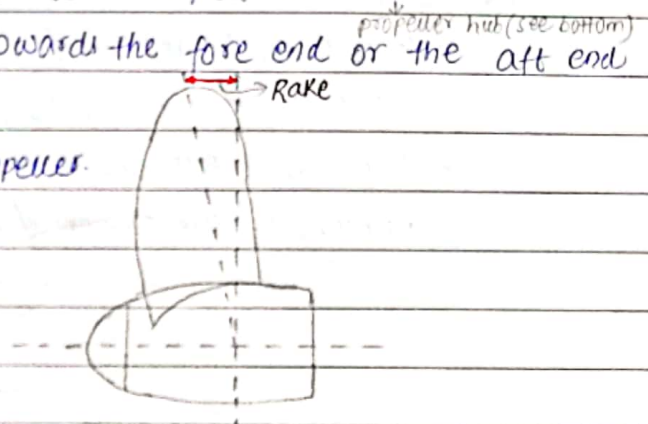
Q. ⑤ Transom floor.

- It is the floor at the head of the rudder post which supports the framework of the stern.
- It must have the same depth as the floors in the double bottom tanks.

Q. ⑥ Describe the following terms with suitable sketches as applicable: (3 times)

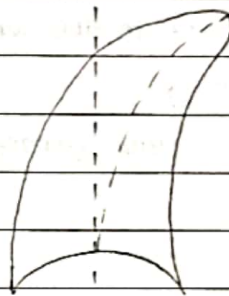
① Rake of propeller (5 times)

- When the propeller is viewed from sideways, we see that blades of the propeller are not perpendicular with respect to its hub.
- It is tilted at an angle either towards the fore end or the aft end of the ship.
- This is termed as "rake" of propeller.



② Propeller skew

- The propeller is bent or twisted sideways which is termed as a **propeller skew**.
- There are two types of skew: balanced & unbalanced.
- After years of analysis & sea trials, it was observed that skewing a ship propeller nullifies or minimises the unsteady hydrodynamic loading in the flow field.



③ Propeller boss

- The central portion of the screw propeller which carries the blade, and forms a medium of attachment to the propeller shaft is termed as **propeller boss**.
- It is also known as propeller hub.

Propeller hub: A central covering that is found in the middle of the propeller designed to cover the locking propeller nut securing.



(d)

Pitch

Pitch of a propeller can be defined as the displacement that a propeller make for every full revolution of 360°.

It is the distance the propeller would move forward in one rotation.

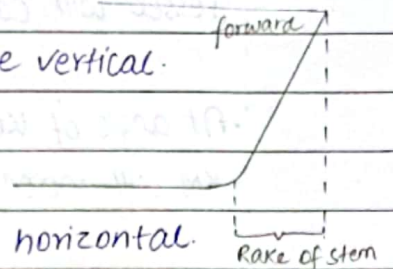
Q.7

Define the following.

(a)

Rake of stem

It is the inclination of the stem line from the vertical.



(b)

Keel rake

It is the inclination of the keel line from the horizontal.

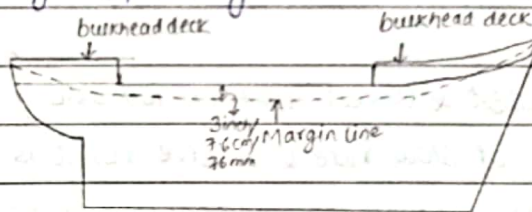
(c)

Margin line

• It is a line drawn atleast 76mm below the upper surface of the bulkhead deck at ship's side, as agreed by the SOLAS convention 1929.

• It is the highest permissible location on the side of the vessel in case of sinking, heel or trim

• It is a margin of safety line or a line of safety.



(d)

Load displacement.

It is the maximum displacement of ship when loaded or floating at her summer draft in SW.

(e)

TPC

It is the (mass or) no. of tonnes which causes the ship to rise or sink by 1cm.

$$TPC = \frac{A}{100} \times \text{density} ; \text{unit: t/cm}$$

(f)

FWA

It is the no. of inches by which the mean draft of the ship changes, when she passes from salt water (SW) to fresh water (FW)

$$FWA = \frac{W}{40TPC}$$

Q. NO. (8): What is Angle of Loll? How will you determine that the vessel is at Angle of Loll? How do you go about correcting angle of Loll?

Ans:-

- **Angle of Loll** is the state of a ship that is unstable when upright.
- If a vessel has a small GM or little negative GM,
 - (i) any increase in FSE and/or (ii) any loading on topside, will cause GM to reduce or GM becomes negative; and any external forces acting on vessel will cause vessel to take angle of loll.

- At angle of loll, vessel will be at neutral equilibrium.
- KM will increase sufficiently equal to KG, thus making GM of vessel zero.

Preventive action for correcting the angle of loll:-

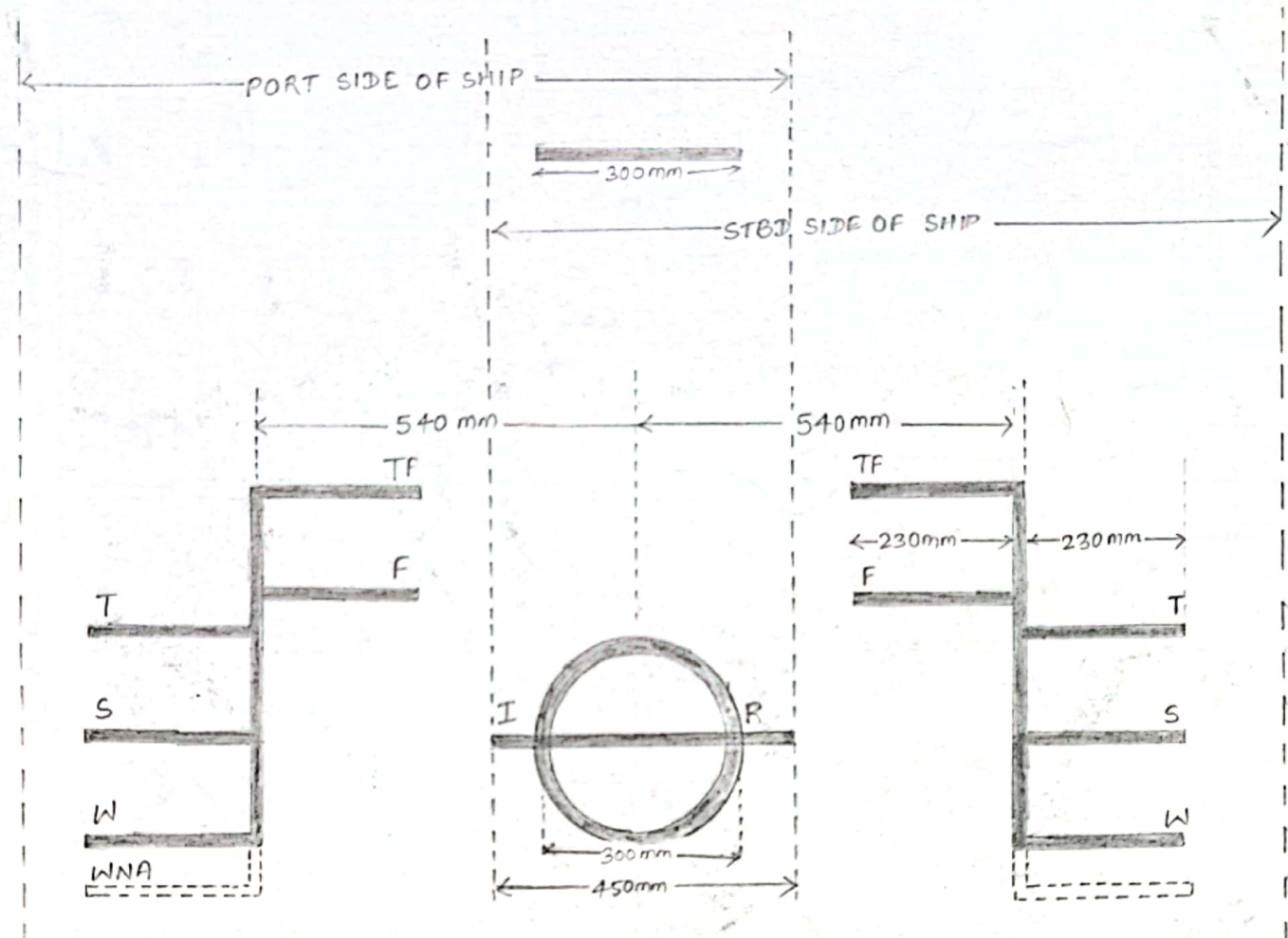
- Turn the ship & take wind, swell etc. on head.
- If any derrick or crane is not well parked, do that.
- Check soundings of all tanks.
- If there is any partially filled tank, deballast it to reduce FSE.
- Ask engine room to take soundings of fuel tank & transfer fuel in partial filled tank.

For correcting:

- Select the smallest & lowest tank on loll side
- Start filling up at slow rate & observe vessel is coming upright or not.
- Then identical tank on other side should also be ballasted.
- Note: one tank at one time.
- Then, select second smallest tank on the loll side
- If there is any water in TST, deballast higher tanks
- Our overall **intention** is to (i) **reduce FSE** (ii) **increase GM**
- By filling the lower tank, we lower the KG



Q.No 9) Draw load lines of cargo ship.





Q. 4) MARPOL / BALLAST WATER MANAGEMENT

Q. ① Explain what all information are available in **SOPEP** (4 times) (OR)

Explain the purpose & content of **SOPEP**. (5 times)

Ans:- MARPOL 73/78 Annex 1 Regulation 26 states "Every ship of 400 GRT and above & every oil tanker of 150 GRT and above shall carry a Shipboard Oil Pollution Emergency Plan approved by the Administration."

Purpose of the plan:-

- The shipboard oil pollution emergency plan (SOPEP) is seen as information from the owners to the Master of a particular ship.
- It provide guidance to the Master and officers on steps to be taken in case of an oil spill to make it less severe.
- It provide operational aspects for various oil spill scenarios.
- It provide list of authorities or person to be contacted in case of an oil spill

Contents of SOPEP

- The action plan which contains duties of each crew member including their muster stations.
- General particular of the ship.
- General arrangement plan
- Capacity Plan
- Shell expansion plan
- Pumping arrangement including various oil lines, positioning of vents, save all trays etc.
- The location of the SOPEP locker & contents of a locker with a list of inventory.
- Steps and procedures to contain the discharge of oil into the sea using SOPEP equipment.
- Lists of authorities or person to be contacted in case of an oil spill.
- The reporting procedure in case of an oil spill is described.
- Guidance to keep the records of the pollution incident (for liability, compensation and insurance purpose).

Q.② Write a short notes on **SMPEP** (2 times)

- Ans:-
- A Shipboard marine pollution emergency plan (SMPEP) is a flag or class approved document which provide guidance to the master and officers in case of a collision or fire on a ship.
 - MARPOL 73/78 Annex II Regulation 17 states that every ship of 150 GRT and above certified to carry noxious liquid substance in bulk shall have an approved SMPEP for noxious liquid substance.
 - The SMPEP for oil and/or noxious liquid substance should be combined with SOPEP, since their contents are almost same.
 - To make it clear that plan is a combined one, it should be referred to as a SMPEP.

Contents of SMPEP

same as SOPEP (P-157)

Q.③ Describe Oil Record book (8 times)

- Ans:-
- Oil record book Part-I shall must be provided to every oil tanker of 150 GRT and above & every ship of 400 GRT and above. It deals with machinery space operation for all ships.
 - In addition, for every oil tanker of 150 GRT and above Oil record book Part-II shall also be provided to record cargo/ballast operation.
 - When making entries in the ORB, the date, the operational letter code and item number shall be inserted in the appropriate columns.
 - The entries in the ORB shall be in English.
 - Only one official ORB to be maintained.
 - Records are properly kept and they are kept onboard for atleast 3 years from the new ORB came into force.
 - Each page of the ORB is properly dated and signed by Master and chief engineer officer.
 - Any failure of oil filtering equipment shall be recorded in ORB

+

Entries to be made DRB Part-I:

- A Ballasting or cleaning of oil fuel tank
 - B Discharge of dirty ballast or cleaning water from Oil fuel tanks
 - C Collection, Transfer and Disposal of oil residues (Sludge)
 - D Non-automatic starting of discharge overboard, transfer or disposal otherwise of bilge water which has accumulated in Machinery spaces.
 - E Automatic starting of discharge overboard, transfer or disposal otherwise of bilge water which has accumulated in machinery spaces.
 - F Condition of oil filtering equipment.
 - G Accidental or other exceptional discharges of oil
 - H Bunkering of fuel or fuel lubricating oil
 - I Additional operational procedures and General Remarks
- D+E = Discharge overboard or disposal otherwise of engine room bilge water.

Entries to be made in DRB Part II:

- Loading of oil cargo
- Internal transfer of oil cargo during voyage.
- Unloading of oil cargo.
- Cleaning of cargo tanks including crude oil washing.
- Ballasting of cargo tanks and dedicated CBT. (clean ballast tank)
- Discharge of ballast except from segregated ballast tanks
- Discharge of water from slop tank.
- Accidental or other exceptional discharges of oil or oily mixture.

Q. (4) Write short note on Cargo Record BOOK. (2-times)

- Ans:-
- All operations on-board ship that involve noxious liquid substances have to be entered in cargo record book.
 - When making entries in CRB, the date, the operational letter code and item number shall be inserted in appropriate columns.
 - The entries in the CRB shall be in English.
 - Each page of the CRB is properly dated & signed by master.
 - The master should obtain a receipt from shore reception facility specifying the date, time and quantity of tank washing transferred. This receipt must be kept together with CRB.

Entries to be made in CRB :- same as DRB Part - II



Q.5 Write short note on (OR), Explain the purpose & content of.

(a) Garbage management plan (6 times)

Ans:- All ships of 400 GRT and above & every ship certified to carry 15 persons or more must have a garbage management plan.

A garbage management plan should

- designate the person responsible for carrying out the plan.
- be in the working language of the crew.
- provide written procedure for collecting, storing, processing and disposing of garbage.
- contain written procedures for the use of equipment on-board.

List the records to be maintained as per MARPOL Annex V

(b) Garbage record book (3 times)

• All ships of 400 GRT and above & every ship certified to carry 15 persons or more must carry a garbage record book.

• Garbage record book Part-I is for all garbage other than cargo residue and is applicable for all ships.

• Garbage record book Part-II is for cargo residues and only applicable for ships carrying solid bulk cargo.

Entries to be made in GRB:-

- When garbage is discharged into the sea or the shore reception facility.
- When garbage is incinerated.
- Accidental and other exceptional discharge of garbage along with time of occurrence, position of vessel at the time of occurrence, estimated amount in m^3 and the reason of disposal.
- When the cargo residue is transferred to the port reception facility, the receipt received should be kept on-board for at least two years.

(c) Vessel Response Plan (VRP)

- It provides guidance to the vessel in case of an offshore spill.
- It is required by the USCA for vessels carrying certain quantities of chemical or refined petroleum product.
- It contains general particulars of the ship, list of zones that the vessel intends to operate in, information of person or authorities which is to be notified in the case of spill.
- In recent articles of USCA, they point out that VRP is not limited to spill, it also includes conditions such as engine casualty, grounding, fire or flooding.



Q.6 Define the following as per MARPOL 73/78:

(a) Emission control areas (2 times)

- Emission control areas are sea areas where stricter controls were established to minimize airborne emissions from ships as defined by Annex VI of 1997 MARPOL protocol.
- As of 2011, emission control areas are:
 - Baltic sea Area
 - North sea Area
 - United states caribbean sea area
 - North American area covering pacific & atlantic coast of U.S & Canada, incl. Hawaii
- Regulation says that marine fuel must not have more than 0.1% sulphur content.

(b) Special area. (2 times)

- Special areas are certain sea areas where adoption of special mandatory methods for prevention of sea pollution is required due to their oceanographical and ecological condition.
- There are special requirements regarding discharge/disposal of oil/garbage in special areas.
- The purpose of special area is to protect one or more special habitats and/or species in that area.

(c) Nearest land.

2. It means the limit of internal water or the areas defined in the MARPOL 73/78 convention
3. You must be a specific distance from the nearest land before a discharge at sea can be made.
1. "From nearest land" generally means from a country's territorial sea baseline.



Q.7) (a) What are the special areas as per Annex I & II of MARPOL 73/78 (5 times)

Ans:- * Special areas as per Annex I presently are:

- The mediterranean sea
- The Baltic sea
- The Black sea
- The Red sea
- The Persian Gulf
- The Gulf of Ader
- The Antarctic
- The North west european water, and,
- The Oman area of the Arabian sea

* Special areas as per Annex II presently are:

- The Baltic sea
- The Black sea, and,
- The Antarctic area (sea area south of Lat 60's)

(b) What are the special areas as per Annex IV & V of MARPOL 73/78

Ans:- * Special areas as per Annex IV presently are

- The Baltic sea area is only special area under Annex IV

* Special areas as per Annex V presently are

- The mediterranean sea
- The Baltic sea
- The Black sea
- The Red sea
- The Persian Gulf
- The North Area
- The Antarctic, and,
- The wider caribbean area



Q. (8) What are the discharge criteria of oil or oily mixture from cargo spaces of an oil tanker as per **Annex I** of MARPOL 73/78? (8 times)

Ans:- The discharge of oil or oily mixture from cargo space is prohibited except when following conditions are satisfied:

(i) The tanker is not in a special area.

Special areas presently are:- (mention all the special areas)

(ii) The tanker is more than 50 nautical miles from the nearest land

50 N.M is measured from the base line from which the territorial sea of the country is established.

(iii) The tanker is proceeding en-route

The tanker cannot be stopped or moving in circles. This is to ensure that oil is distributed over a large area.

(iv) The instantaneous rate of discharge does not exceed 30 litres/NM.

This limits the amount of oil discharged in one place.

(v) The total quantity of oil discharged is not more than $\frac{1}{30000}$ of the quantity of the last cargo.

This limits the total quantity of oil discharged in one voyage.

(vi) The tanker has an operational ODMCS and a slop tank arrangement.

- ODMCS must provide a continuous record of discharge of oil in litres/NM and the total quantity discharged.

- A slop tank is required for all tankers of 150 GRT and above & two slop tank is required for tankers of 70000 DWT and above.

The volume of slop tank must be 3% of the cargo carrying capacity of the ship.

Q. (9) Describe the various cargo categories under **Annex II** of MARPOL 73/78. (3 times)

Ans:- (i) Category X: Noxious liquid substance which, if discharged into the sea from tank cleaning or deballasting operation are deemed to present a **major hazard** to either marine resources or human health and therefore justify the **prohibition** of discharge into the marine environment.

(ii) Category Y: Noxious liquid substance which, if discharged into the sea from tank cleaning or deballasting operation are deemed to present a **hazard** to either marine resources or human health and therefore

justify a **limitation on quality and quantity** of discharge into the marine environment.

(iii) Category Z: Noxious liquid substance which, if discharged into the sea from tank cleaning or deballasting operation are deemed to present a **minor hazard** to either marine resources or human health and therefore justify **less restriction on quality and quantity** of discharge into the marine environment.

(iv) Other substances: Substances indicated as OS in the pollution category of CH-18 of IBC code which fall outside Category X, Y and Z because they are considered to present no harm to marine resources and human health.

(b) What are the discharge criteria as per **Annex II** of MARPOL 73/78? (3 time)

Ans:- The discharge of noxious liquid substance is prohibited ^{except} when following conditions are satisfied:

(i) The ship is proceeding enroute at a speed of atleast 7 knots in case of self-propelled ships or atleast 4 knots in case of ships which are not self-propelled.

(ii) The discharge is to be made below the waterline through the under water discharge outlet(s) not exceeding the maximum rate for which the underwater outlet is designed.

(iii) The discharge is to be made at a distance of not less than 12 NM from the nearest land.

(iv) The discharge is to be made at a depth of water of not less than 25 metres.

(v) For ship constructed before 1 January 2007, the discharge of residue of substances under category Z below the waterline is not mandatory.



Q ⑩: What are the discharge criteria as per **Annex IV** of MARPOL 73/78? (2 times)

Ans:- The discharge of sewage is prohibited except when following conditions are satisfied:

- If sewage is comminuted & disinfected, the discharge can be made when ship is not less than **3 NM** from the nearest land.
- If sewage is **not** comminuted & disinfected, the discharge can be made when ship is not less than **12 NM** from the nearest land.
- Sewage from holding tank should not be discharged instantaneously but at a moderate rate when ship is enroute with a minimum speed of 4 knots.
- The ship has in operation an approved sewage treatment plant which has been certified and whose test results are laid down in ISPP certificate.

Q ⑪ @ What are the discharge criteria for disposal of garbage at sea as per **Annex V** of MARPOL 73/78? (5 times)

⑥ List the different categories of cargo as per MARPOL **Annex V**.

Ans:-	Type of Garbage	Disposal Regulations	
		Outside Special Areas	In special areas.
	All plastics including synthetic ropes, synthetic fishing nets, plastic garbage bags & toxic inorganic ash of plastic products	PROHIBITED	PROHIBITED
	Dunnage, lining & packing material which will float	≥ 25 N.M from nearest land	PROHIBITED
	Paper products, rags, glass, metal, bottles, crockery and similar items	≥ 12 N.M from nearest land or ≥ 3 N.M from nearest land if comminuted & ground to a size of less than 25 MM	PROHIBITED
	Food wastes	≥ 12 N.M from nearest land or ≥ 3 N.M from nearest land if comminuted & ground to a size of less than 25 MM	≥ 12 N.M from nearest land

Q.12: Describe the controls on emissions of SO_x & NO_x in SECA areas as per **Annex VI** of MARPOL 73/78?

Ans:- * Control of Nitrogen oxides (NO_x)

- This regulation applies to each diesel engine with a power output of more than 130 kW which is installed on a constructed ship or which undergoes a major conversion on or after 1 January 2000.
- This regulation does not apply to engines installed on boats which are intended to be used in case of emergency.
- Operation of diesel engine is prohibited except when NO_x emission is within the following limit:
 - 17.0 g/kWh when n is less than 130 rpm.
 - $45.0 \times n^{-0.2}$ g/kWh when n is 130 or more but less than 2000 rpm.
 - 9.8 g/kWh when n is 2000 rpm or more.

Where, n is crankshaft revolution per minute.

* Control of Sulphur oxides (SO_x)

- The sulphur content of any fuel oil used on-board should not exceed 4.5% m/m, which is reduced to 0.5% m/m from 01/01/2020.
- With SO_x emission control area:

- The sulphur content of any fuel oil used on board should not exceed 1.5% m/m, which is reduced to 0.1% m/m from 01/01/2015.
- Ships using separate fuel oils shall allow sufficient time to fuel oil service system to get fully flushed of all fuels exceeding 1.5% m/m sulphur content before entering SO_x emission control area.

Q.13: With help of suitable diagram, explain the working of sewage treatment plant.

Ans:- • The most preferred type of sewage treatment plant is that involving **aerobic bacteria**.

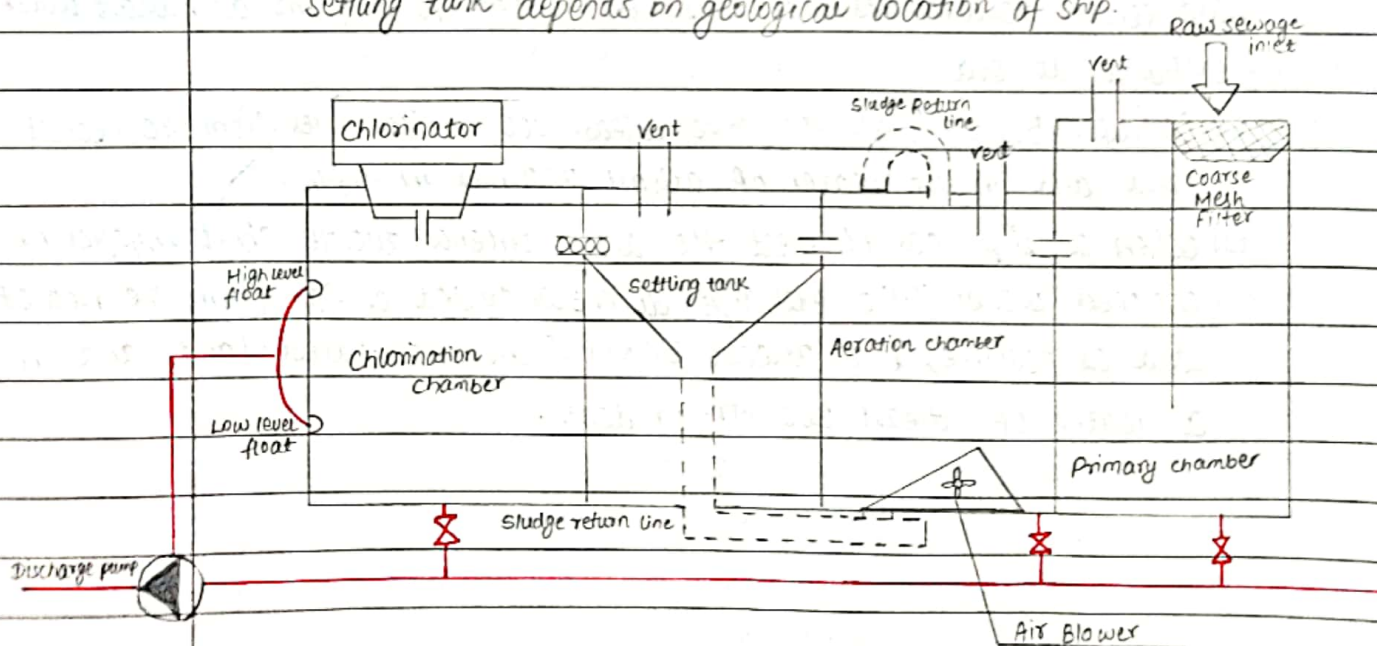
- In plant, the decomposition of raw sewage is done by aerating the sewage chamber with fresh air.
- The aerobic bacteria survive on this fresh air and decompose the raw sewage.



- Air is very important in the functioning of sewage treatment plant because if air is not present, it will lead to growth of anaerobic bacteria which produce toxic gases such as H_2S & methane which are hazardous to health.
- Also, decomposition of sewage with anaerobic bacteria, generate black liquid which causes discolouration of water when discharging.
- Thus, the main aim is to maintain the flow of fresh air.

The sewage treatment plant is divided into three chambers:

- Aeration chamber:** This chamber is fed with raw sewage where it is grounded to form small particles. The air is forced into the chamber. The pressure of air flow play an important role in decomposition of sewage. Too high or too low pressure will not work & hence the controlled pressure is important inside the chamber. Generally, pressure is kept around 0.3-0.4 bars.
- Settling tank:** The mixture of liquid and sludge is passed to settling tank from the aeration chamber. In the settling tank, the sludge settles at the bottom and clear liquid stays on top. The sludge formed is recycled with incoming sludge and assist in breakdown of sewage.
- Chlorination and collection:** The liquid produced in settling tank is disinfected with the help of chlorine. To reduce the bacteria to acceptable level chlorination is done. It is then discharged overboard or send to settling tank depends on geological location of ship.





BALLAST WATER MANAGEMENT

Q.14) @ What is the relevance of Ballast water convention in marine environment protection?

- Ans:-
- The main relevance of ballast water convention is to control the pollution ^{caused} from ballast water when discharged from one location into different ecology.
 - This convention is intended at stopping the transfer of unnecessary aquatic organism and pathogens through the discharge of ballast water.
 - The intention is to preserve ecology in biologically rich coastal water and similarly in deep oceanic water.
 - The intention is achieved by doing ballast water exchange during the vessel's voyage.
 - By doing so, the pollution caused by ballast water can be controlled.
 - Because, the aquatic organism and/or pathogens which are taken in coastal waters are less likely to survive in deep oceanic water & similarly which are taken in deep oceanic water are less likely to survive in coastal water due to changes in the water's chemistry, temperature and salinity.

(b) As per BWM convention, describe the exchange criteria for ballast water.

(DR),
Where do you change water ballast as per ballast water management

Ans:- Ballast water exchange cannot be carried out anywhere at sea. There are certain requirements that must be complied to perform a ballast water exchange at sea.

- (1) Conduct ballast water exchange at least 200 nautical miles from the nearest land and in the water of at least 200 mtr. in depth.
- (2) When a ship cannot meet the above criteria due to short voyages or enclosed waters, the exchange is to be conducted as far from the nearest land as possible, but at least 50 NM from the nearest land and in a water of at least 200 mtr. in depth.



Q. ④ Explain D1 and D2 standards of ballast water management.

Ans:- * Regulation D1 (Ballast water exchange standard)

- This standard is to replace the ballast water in mid-sea.
- This method is based on the fact that species from coastal water cannot survive in deep water & species from deep water cannot survive in coastal water.
- When replacing the ballast water at sea, BWM convention regulation D1 requires that atleast 95% of the ballast water need to be exchanged.
- It can be achieved by two ways:
 - Either deballast atleast 95% of the volume of ballast water and then re-fill it (5% is allowed for unpumpable ballast)
 - Or keep ballasting the ballast tank & keep overflowing it through air pipe or any other openings. BWM convention regulation D1 requires to pump in 3 times of tank capacity to achieve 95% of ballast exchange.

* Regulation D2 (Ballast water performance standard)

- The regulation D1 is temporary & ultimately all ships need to arrive at regulation D2.
- It aims to control number of species that can be discharged.
- Ballast water need to have **less than 10 viable organism** per cubic meter.
- This can be achieved by Ballast water treatment system
- This system is fitted before the ballast overboard and treats the ballast water to required standard before the ballast water goes overboard.

Q. ⑤ What are the different methods of ballast exchange and precautions during such operations.

Ans:- ① Sequential method

- In this process, the ballast tank is first emptied and then refill with new ballast water to achieve 95% of ballast exchange.
- All of the ballast water in each tank is deballasted until suction of the ballast pump is lost & eduction should be done to avoid a

Situation where organisms are left in the bottom.

- The tanks are then refilled with new water.
- 5% is allowed for unpumpable ballast water
- Exchange can be carried out individually or in pairs.

(b) Flow-through method.

- In this process, the replacement ballast water is pumped into a ballast tank & keep allowing water to overflow through air pipe or any other opening to achieve 95% of ballast tank.
- Regulation 23 requires to pump in ^{ballast water} 3 times of tank capacity to achieve 95% of ballast exchange.

(c) Dilution method

- In this process, the replacement ballast water is filled from top of the ballast tank & simultaneously discharge from the bottom at the same rate.
- The tank level should be maintained throughout the ballast exchange operation.
- At least 3 times of tank capacity is to be pumped through the tank.
- Two ballast pumps are used, one is acting as a filling pump and other as a suction pump.

Precautions during such operation:

- Maintain adequate stability in accordance with an approved trim and stability booklet taking free surface effect in account.
- Maintain permissible shearing forces and bending moments.
- Avoid over and under pressurization of ballast tank.
- The aft draft should not decrease below the propeller immersion draft.
- The trim should be such that it does not affect bridge visibility.
- Admissible weather conditions.
- Slashing load to be taken into account & one tank is to be kept slack at one time.
- Water-tight opening which may have opened during ballast exchange must be re-secured.

R-8 MARITIME LEGISLATION (SOLAS/ISPS/ISM)

Q-① Explain the role of classification societies in marine industry. (6 times)

- Ans:
- The classification society is a non-governmental organisation that establish and maintain technical standards for the construction and operation of ships and offshore structures.
 - It certify & ensures that the construction of vessels are as per relevant standards.
 - They survey the ship and structures during the process of construction and commissioning.
 - They carry periodically survey on vessels to ensure that the vessels are continue to meet the rules.
 - Classification societies are also responsible for oil platform, other offshore structures and submarines.
 - The classification societies are authorised to inspect and issue certificates on behalf of the flag state.
 - Classification society also carry out the docking survey, upwater survey etc.
 - Classification society employ naval architects, ship surveyors, engineers etc. often located at ports around the world.
 - The larger societies also conduct research at their own research facilities in order to improve the effectiveness of their rule.
 - They also make new innovation in ship building related to safety.

Q-② With respect to UNCLOS, define the following

@ Base line (5 times)

- Ans:
- A base line, as defined by the United Nation convention on the law of the sea (UNCLOS), is the line along the coast from which the seaward limit of a country's territorial sea (and other maritime zones of jurisdiction) are measured.
 - Normally, baseline follows the low-water line of coastal state

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ⓑ Territorial water (8 times)

- Ans:-
- Territorial water, as defined by the UNCLOS, is 12 nautical miles zone measured from the base line.
 - This zone is part of the territory of the country.
 - Within this zone, the country is at complete freedom to do what it wants because the law of the country is applicable within this zone.
 - After that, international law will apply.

ⓒ Contiguous zone (2 times)

- The contiguous zone of a country, is 24 nautical miles zone measured from the base line. (basically 12-24 NM)
- This zone is not part of the territory of the country but the country can claim some specific rights for some specific purposes.
- Within this zone, the country can claim rights for customs, immigration, fiscal and health enforcement purposes.

ⓓ Exclusive economic zone (EEZ) (11 times)

- The exclusive economic zone (EEZ) of a country, extends upto 200 nautical miles measured from the base line. (basically 12-200 NM)
- Within this zone, the country can claim for exploration and exploitation of the marine resources for its own commercial purpose.
- Exploration and exploitation of the marine resources means oil, gas exploration, fishing etc.
- The country can also lay submarine pipelines and cables.
- When, EEZ overlaps between two neighbouring countries, they mutually agree to a limit (which will be of course less than 200 NM for each country)

ⓔ Continental shelf (3 times)

- The continental shelf (CS) of a country, extends upto 350 nautical miles measured from the base line. (basically 12-350 NM)
- Within this zone, a country can claim for seabed mining and conducting marine scientific research.

• The ~~term~~ "continental shelf" is the area of seabed around a large land mass where the sea is relatively shallow compared with the open sea.

• It typically extends from coast to depth of 100-200 mtrs.

Ⓕ Right to Innocent passage

• Innocent passage is a concept in law of sea that allows for a vessel to pass through the territorial water of another state, subject to certain restrictions.

• The passage are innocent until you are not engaged in activities like fishing, pollution, weapon practise, spying etc.

• The sub-marines & other underwater crafts are required to navigate on surface and show their flag.

• Nation can also suspend innocent passage in specific areas of their territorial sea, if doing so is essential for their security.

Q.③ Write short notes on "Hours of rest" as per **STCW 2010** (6-times)

Briefly state the requirements for rest hours for waterkeeper as per STCW 2010.

Ans:- STCW chapter A-VIII/1 (Fitness for duty) defines the work and rest hours requirement. Those are:-

(i) a minimum of 10 hours of rest in **any** 24 hour period.

(ii) a minimum 77 hours of rest in **any** 7 days period.

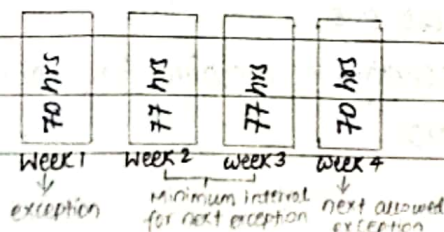
(iii) Rest should ^{not} be divided into more than 2 periods. And, one of this period should be of atleast 6 hours.

Like, we require 10 hours of rest in any 24 hours, so the required 10 hours rest can be in combination of 6+4, 8+2 etc but cannot be like 6+2+2 or 5+5

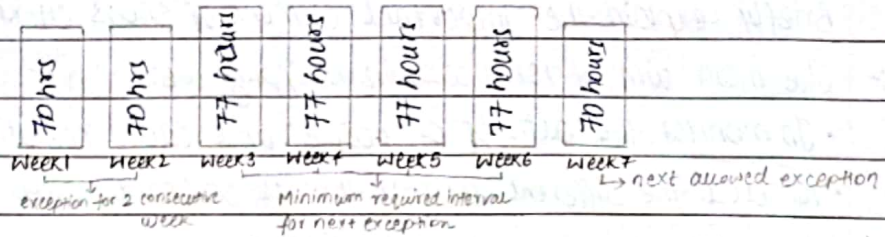
(iv) Interval between consecutive period of rest shall not exceed 14 hours.

(v) Exception to 77 hours of rest in **any** 7 days period

Like if exception are used for one week, the next exemption can only be after two week.



If exception are used for two consecutive week, the next exemption can be after 4 week.



(vi) Exception to 10 hours of rest divided into no more than 2 periods.

- This exception allows 6+2+2, 7+2+1, 8+1+1 etc
- But this exception can only be used for maximum of two-times in any 7 day period.

Note:- In above points, word "any" means from any point of time to any point of time, not from midnight.

Q. (4) List 10 statutory certificate to be carried on a general cargo ship as mentioned in **SOLAS**.

Ans:- Those are as follows:-

- 1 (i) Certificate of Registry
- (ii) International Tonnage certificate
- 4 (iii) International Loadline certificate.
- (iv) International Ship security certificate.
- (v) International oil pollution certificate (IOPP)
- (vi) Intact stability certificate.
- 4 (vii) Minimum safe manning certificate
- (viii) Document of compliance
- (ix) Safety management certificate
- (x) Damage control booklets.
- 3 (xi) Oil record book
- (xii) Garbage record book
- (xiii) Exemption certificate.

ISPS

Q.5) Describe the objective & functional requirement of **ISPS code**. (2-times) (or)

Briefly explain the important element of SOLAS XI-2 i.e. ISPS code.

Ans:- The main aim of ISPS code in shipping are:-

- To monitor the activity of people and cargo operation.
- To detect the different security threats on-board vessel and in port and implement the measure as per the situation.
- To provide a security level to the ship and derive various duties and functions at the different security level.
- To build and implement roles and responsibilities for port state officers and on-board officers to tackle maritime security threat.

Functional requirement of ISPS code are:-

- Gather and assess information with respect to security threats and exchange such information with appropriate contracting governments.
- Require communication protocol for ships and port facilities.
- Prevent unauthorized access to ships, port facilities and their restricted areas.
- Prevent introduction of unauthorized weapons, intrinsically unsafe devices or explosives to ships or port facilities.
- Require ship and port facility security plan
- Require training, drills and exercises to ensure familiarity with security plans & procedures.

Q.6) Write briefly about DOS and CSR as per ISPS code. (3-times)

Ans:- Declaration of security (DOS)

- A declaration of security (DOS) is a declaration that addresses the security requirements between a port facility & ship or between a ship & another ship.
- It is an agreement between both parties.
- It confirms the security responsibility of each party during a ship-port interface or ship-ship interface.
- A DOS may be requested by either a PFSD or S&D within the terms of ISPS code.
- Ship must keep the DOS from last ten port of call for inspection by PSC.

- The Circumstances where Dos is required is mentioned in ship security plan.
- The declaration of society (Dos) shall be completed by:
 - The master or ship security officer on behalf of ship.
 - The port facility security officer (PFSO) on behalf of port facility.

Continuous synopsis record (CSR)

- Continuous synopsis record is a special measure under SOLAS for enhancing the maritime security at sea.
- The purpose of CSR is to avoid the anonymity to the ship's history.
- As per SOLAS XI-1, all passenger ship and all cargo ships of 500 GRT and above engaged in international voyages have to maintain a CSR.
- The CSR shall contain the details of the ship from the time of the first owner.
- The continuous synopsis record (CSR) must be kept on-board even when
 - the vessel transfers to another flag state.
 - the vessel is sold to another owner.
 - the vessel is managed by another company.

Q. 7) State the different security levels as per the ISPS code and your actions as duty officer in port at each level.

Ans:- (i) Security level 1:

- It is the level at which the ship or port facilities normally operate.
- At this level, minimum appropriate protective security measures shall be maintained at all times.
- Normal monitoring of deck areas and areas surrounding the ship.
- 4 • 1 out of 10 person must be checked properly.
- 5 • Normal searching of baggage, persons etc. are done during embarking and disembarking.

(ii) Security level 2:

- Assign additional personnel for patrolling the access areas.
- Limit the no. of access point to the ship & establish a restricted area on shore side.
- Block waterside access to the ship.

- 4 • Increase the search frequency. 1 out of 2 persons must be checked.
- 5 • Detailed searching of baggage & persons are done during embarking and disembarking
- Escort all visitors onboard
- Carry out full or partial search of the ship.

(iii) Security level 03

- It is a level applying for period of time when there is probable or imminent risk of a security incident.
- Limit the access point to a single controlled access point.
- Grant access only to authorised personnel and those responding to security incident.
- Suspend embarkation and disembarkation
- Suspend cargo operation and stores etc.
- Close monitoring of the movement of people on-board.
- preparing for a full or partial search of the ship.

ISM

Write short note on ISM code.

Q.8: What are the functions and objective of ISM code? (4-times)

- Ans:-
- The International safety management (ISM) code is a management code which enables to maintain high standard of safety & environment protection.
 - The purpose of this code is to provide an international standard for the safe management and operation of ships & for the pollution prevention.

The objective of ISM code are as follows:

- To provide standard for safe practices in ship operation and a safe working environment.
- To assess all identified risks to the ship, personnel and environment.
- To establish safeguard against all identified risks.
- To continuously improve safety management skill of personal ashore and aboard ship.
- To prepare the personnel for emergencies related both to safety and environment protection.

Q.9) What is safety management system under ISM code? (5 times)

- Ans:-
- The safety management system is the core requirement for the implementation of ISM code.
 - The safety management system should ensure:
 - the compliance of mandatory rules and regulation.
 - that codes, guidelines and standards recommended by the organisation, administrations, and classification societies are taken into account.
 - It aims to ensure that safety is secured, humans are protected from injury and harm, and the environment and property are not damaged.

Q.10) What are the functional requirements of safety management system (SMS) as per ISM code? (2 times)

- Ans:-
- Every company should develop, implement and maintain a safety management system (SMS) which includes the following functional requirements:-
- A safety and environment protection policy.
 - Instructions and procedures to ensure safe operation of ship and protection of environment.
 - Defined level of authority like DPA, CSO etc.
 - Defined line of communication between and among shore and shipboard personnel.
 - Procedure for reporting accidents and non-conformities with the provisions of this code.
 - Procedure to prepare for and respond to emergency situations.
 - Procedure for internal audit and management reviews.

Q.11) Explain the elements of ISM code (2 times)

Ans:- There are seven important elements of ISM code.

(i) Company

Company means the owner of the ship (or) any other organization (or) person such as manager (or) charterer who has taken over the responsibility for operation of ship and agreed to take over all the duties and responsibilities as per ^{the} ISM code.

(ii) Company's responsibility

- ISM code is all about company.
- If you read the ISM code, all lines of the code starts with "Company should" or "Company is responsible".

(iii) Internal Audit

- ISM code requires that internal audit of each vessel should be conducted atleast every 12 months.
- An effective internal audit is the main dividing line between a good ship management company and a bad one.
- The superintendent of vessel cannot carry out the internal audit of vessel they are managing.

(iv) Certificates as per ISM code.

There are two statutory certificate that are required as per ISM code:

- Document of compliance (DOC) for company.
- Safety management system certificate (SMC) for ship.

(v) Designated person ashore (DPA) (3-times)

- ISM code requires the company to nominate a designated person who will be a link between ship and shore.
- A designated person ashore:
 - should have access to the highest level of management.
 - is responsible for monitoring the safety and pollution prevention aspects of the operation of each ship.
 - is responsible for ensuring the adequate resources and shore based support.

(vi) Observation, Non-conformity and major non-conformity.

During the audits, the auditor may find some deficiencies. These deficiency are divided into three categories:

- **Observation**: It means that statement of fact made during audit but (substantiated by objective evidence) proof of corrective action are shown.
Example:- A/E critical spare part is not onboard as they were consumed recently but the requisition are there for the same.
- **Non-conformity (3-times)**: It means that an observation are made where objective evidence indicates the non-fulfilment of the special requirement.

Example: A/E critical spare is not on-board as they were consumed recently but the requisition are **not** made for the same.

- Major Non-conformity: • It means a deficiency that poses a serious threat to the safety of personnel or ship, pose a risk to the environment.
- It requires immediate corrective action.
- It shows the lack of effective implementation of ISM code.
- Ship cannot sail with major non-conformity.

Example:- life boat engine not starting, failure of OSMCS, emergency generator failure etc.

(vii) Master's Review

- Master has to review the effectiveness of SMS on-board.
- Master is required to report any noted deficiency in the SMS.
- Master can give suggestions to improve SMS.
- Master can give review and comment on shore based support & how this can be improved.

Q. (11) What is "Near miss"? (3 times)

- Ans:-
- Near miss is a sequence of event which does not cause any personnel injury or property damage but could have lead to an unfortunate condition.
 - The loss was prevented due to sudden break in the train of event.
 - A slight shift in time or position, helps to prevent an accident.

Q. (12) Write briefly about DOC & SMC as per ISM code. (5 times) (OR)
Write short notes on certificate issued under ISM

- Ans:-
- Document of compliance (DOC)
- A document of compliance (DOC) is issued to a **company** based on the type of ship that company operates.
 - A DOC is specific to the ship's type that company operates and for which the SMS is implemented at the time of audit.
 - The DOC is issued to the company when shore side aspect of safety management system are complied as per the ISM code.

• In case of newly build shipping company or new type of ship is added,

the company shall undergo **initial audit** within the validity period of **Interim DOC** i.e. **12 months**.

- A **Short term DOC** is issued on the day of audit on completion of initial audit process whose **validity** is **5 months**.
- The **DOC** is then issued by flag state government like DGs in India on successful fulfilment of initial audit or Interim DOC requirement.
- It is issued after atleast three month of implementation of SMS at the company.
- The **validity** of **DOC** after initial audit is **5 years** and is subject to **annual** audit.
- If a major non-conformity is found in the audit, the DOC is withdrawn.

Safety management system certificate (SMC)

- A safety management certificate (**SMC**) is issued to **each** individual **ship** that are owned/operated by company holding a Main DOC, Interim DOC or short term DOC.
- Each individual ship must have a SMS which ensures that it complies with the safety management based on ISM.
- The SMC is issued to the ship when ship side aspect of safety management system are complied as per the ISM code.
- In case of newly built ship or change in management company of ship, the ship shall undergo **initial audit** within the validity period of **Interim SMC** i.e. **6 months**.
- A **Short term SMC** is issued on the day of audit on the completion of initial audit process whose **validity** is **5 months**.
- The **SMC** is then issued by flag state government like DGs in India on successful fulfilment of initial audit or Interim DOC requirement.
- The **validity** of **SMC** after initial audit is **5 years** and is subject to **intermediate** audit.
- The intermediate audit is carried out between second & third anniversary of ship.
- If a major non-conformity is found in the audit, the SMC and DOC are withdrawn.
- The original SMC is kept on ship and copy is kept on company.



ISPS

Q. (13)

Describe the content of ship security plans. (3 times)

Ans:-

The ship security plan (SSP) must address the following aspect:

- Preventive measures against weapons, hazardous substances, devices that may be intended for use against the safety and security of the ship.
- Specific identification of restricted areas.
- Action to be taken when the ship is facing a security threat or breach.
- Evacuation procedure that might have to be carried out in case of a breach.
- Complying with instructions of the contracting government with respect to security levels.
- Specific duties and responsibilities of ship's personnel in case of security.
- Duties and responsibilities of CSO & SSO.
- Location where the SSAs is provided and the guidance on using the SSAs.
- Procedure for auditing security related activities.
- Procedure for trainings and drills associated with the plan.
- Procedure for reporting security related activities.

MLC

Q. (14)

Explain the content of five titles of MLC 2006 (2 times)

Ans:-

(i) Title 1: Minimum requirement for seafarer to work on ship.

- Minimum age
- Medical certificate
- Training and certification
- Recruitment and placement.

(ii) Title 2: Condition of employment

- Seafarer's employment agreement
- Wages
- Hours of rest and hours of work
- Entitlement to leave
- Repatriation
- Manning level
- Seafarer compensation for ship's loss or foundering.

(iii) Title 3: Accommodation, recreation, food and catering

- Accommodation and recreation facilities
- Food and catering.

(iv) Title 4: Health protection, medical care, welfare and society security protection.

- Medical care on-board and ashore
- Ship owner's liability
- Health and safety protection
- Access to shore based welfare facilities
- Social security.

(v) Title 5: Compliance and Enforcement

- Flag state responsibility.
- Port state responsibility.
- Authorization of recognised organisation.
- Maritime labour certificate
- Labour supplying responsibilities.

Q.15) Enumerate the key requirements of MLC 2006.

Ans:-

(i) Minimum age:

- The employment or engagement for work on-board ship of any person under the age of 16 shall be prohibited.
- Night work of seafarer under the age of 18 shall be prohibited.

(ii) Medical certificate

- Seafarer shall not work on a ship unless they are certified as medically fit to perform their duties.

(iii) Training & qualification

- Seafarer shall not work on a ship unless they are trained or certified as competent or otherwise qualified to perform their duties.
- Training and certification in accordance with the IMO shall be considered.

(iv) Recruitment and placement

- All seafarer shall have access to an efficient, adequate and accountable system for finding employment on ship.
- The employment on ship should be without charge to the seafarer.

Q. (16) Write short notes on

(a) OPA 90.

- The oil pollution act of 1990 was passed by United State Congress and signed by president George H.W Bush
- It requires specific operating procedure for tankers in U.S. water.
- It provide facilities for removal of spilled oils
- It defines responsible parties and financial liabilities.
- It assign liability for the cost of cleanup and damage.
- It resulted in instrumental changes in oil production, transportation and distribution industries.

(b) Civil liability convention.

- The civil liability convention was adopted to ensure that adequate compensation is available to the owner of the ship from which the polluting oil escaped or was discharged.
- In case of shipowner found guilty for an oil pollution, the convention does not cap liability.
- The new amendment of civil liability convention is "The 2000 ammendment"
- The CLC deals with pollution for persistant oil which persist longer in enviroment.
- The 2000 ammendment set out the limit of liability
 - For ship under 5000 GRT, liability is limited to 4.51 million SDR (special drawing rights)
 - For ship b/w 5000 to 1,40,000 GRT, liability is limited to 4.51 million SDR + 631 SDR for each additional GRT over 5000
 - For ship over 1,40,000 GRT, liability is limited to 89.77 million SDR.

(c) London dumping convention.

- It is the first ever global convention to protect the marine environment from human activity.
- It has been in force from 1975
- Its objective is to promote effective measures from all sources of marine pollution.
- It take all practicable steps to prevent pollution of the sea by dumping of wastes.

Q. (17) How will you assist CO while preparing a vessel for

(a) ISM audit (2-times)

Ans:-

- All the vessel's certificate (issued by administration or by class) should be valid

- All crew & officers original certificates, licenses & medical certificate should be valid and present on-board

- All non-statutory diagrams and notices should be there on board like muster list, standing orders etc.

- All vessel's drawing should be listed for easy identification and they should have correct ship name

- All SMS manuals should be the current one.

- The safety committee meetings are scheduled and conducted as per company's requirement. (at least one per month)

- All safety equipment, fire-fighting and life saving appliances should be maintained properly and relevant record should be completed

- All maintenance are carried out as per PMS

- The various log books including oil record book, garbage record book etc. should be completed properly with all required entries.

- All chemicals and points should have relevant MSDS.

- All safety signs & poster should be in place.

- All crew member including O/S, wiper and messman should be aware of who & what is DPA, & their duties during an emergency situation.

(b) ISPS audit

- The approval letter of the ship security plan (SSP) should be valid.

- Procedure for contacting shore management in an emergency should be in place.

- The crew should be aware of who & what is CSO & their duties during an emergency situation.

- The CSO contact number should be available on all the common locations.

- The SSO should be aware of all his duties and responsibilities & his/her certificate are valid and placed on-board.

- All the security drills and related training should be carried out

as per the training program establish by the company.

- All safety drills reports are completed properly & forwarded to head office at regular interval.
- Light, projectors & other signs should be in good working condition & ready to be used during emergency situation.
- Security equipment should be maintained and tested to ensure it works efficiently.

(c) Loadline survey.

- Check all the access points, their moving parts, gaskets and watertight packing
- Check ventilators and air pipes, their flaps and closing mechanism.
- Keep deck free from unnecessary tools lying.
- Check hatches and booby hatches, their butterfly screw and weather tightness.
- Check tarpaulins in good condition.
- Check manholes, scupper and other similar parts for watertightness.
- Ensure proper working of non-return valves.
- Keep machinery spaces clean
- All ports under the freeboard deck strictly checked for watertight integrity.
- Fractures in guard rails and bulwarks must be repaired.
- The deckline, loadline marks, draft marks etc. should be de-rusted & painted for inspection.
- All safety equipment must be in order.

(d) Safety Equipment Survey (SER survey)

- Check lifeboat
- Check davits of lifeboat
- Check inflatable liferaft
- Check handheld radios, smoke signals and lifebuoys.
- Check lifejackets. → elaborate by your practical experience
- Check pyrotechnics.
- Check fire control plans and system.
- Check fire detection system and fire fighting equipment
- Check pilot ladders.
- Check IG system, fixed fire fighting system & sprinkler system.

Q.9 LEADERSHIP AND TEAM WORKING SKILLS

Q10 Define **situational awareness**. What are the six barriers to situational awareness (6 times)

Ans:- (OR)
Shipping is very diverse field, in which there would be several entities involved in it such as charterers, stevedores, agents, pilots, customs, PSC inspectors etc.

Different type of cargo need different type of ship.

It is the responsibility of the seafarer that the cargo reaches its correct destination without any loss of life or damage to the cargo/ship/environment.

Hence, a seafarer needs to be very vigilant in performing all the tasks associated with his job onboard a vessel at all times. He needs to be mentally alert & physically ~~act~~ active towards achieving a common objective.

Hence, in shipping "**situational awareness**" is important for safe running of the ship.

The six barriers to situational awareness are:-

(i) Low experience level

- When he/she is unfamiliar with the area or the working culture.

(ii) Complacency

- When it comes to safety, complacency can be dangerous
- When he/she is unaware of actual danger, he/she will be less vigilant which cause a responder to miss seeing, hearing or feeling critical cues.

(iii) Overload

- The average person can only perceive, understand and recall above seven pieces of unrelated information in short term memory.
- After that, person is subject to forgetting, and under stress.
- The brain isn't very good at prioritizing what information is important and what isn't.
- Loading the short term memory with too much information, leading to loss of information.

(iv) Distraction from primary task

- Attention is easily distracted
- While operating in environment where there are loud noises, bright lights, radio traffic and moving people, it provides a distraction.

(v) Fatigue

- Dehydration or heat stress can also cause fatigue.
- Poor fitness level can be a reason for fatigue.
- 24 hours awake affects your decision making capabilities.

(vi) Poor communication.

- The complexity of the spoken words leads to miscommunication.
- When the message is so unexpected & it stuns the receiver, additional message may not be heard or processed
- When a receiver hears two ^{may} messages, it cause a wrong interpretation of spoken word.

Q.2 Explain situational awareness while keeping bridge watch. How situational awareness reduces the possibility of human error. (9 times)

Ans:- Situational awareness demands knowing:

- ① Where is the ship
- ② Where it is planned to be
- ③ Whether any other vessel, event or conditions developing in the vicinity are likely to pose a risk to the safety of the ship.
- ④ When to alter the course or speed.
- ⑤ When to ask for additional hands or assistance in the wheelhouse
- ⑥ When to call the Master.

The oow should develop and maintain situational awareness in the wheelhouse by

- ① Studying the area around the ship.
- ② the ship's intended course & speed & underwater clearances required.
- ③ The possible impact of external influences on the safety of the ship.

The situational awareness on the bridge will be aided by

- ① A clear understanding of the passage plan

- ② A effectively managed bridge team
- ③ A proper & continuous look out by all available means.
- ④ Familiarity with all the equipment & information available from RADAR, AIS, ARPA & ECDIS.
- ⑤ Using look-outs, ECDIS, RADAR and visual monitoring techniques to confirm the navigational safety of the ship.
- ⑥ ~~Using~~ Cross-checking navigational information from different sources
- ⑦ Ability to assess information available on electronic navigation equipment
- ⑧ Ability to prevent over reliance on individual electronic system for safety of navigation.

Situational awareness can reduce human error by focusing in the right direction of situational awareness. The key factors are:-

- Understanding of what is happening in current situation.
- Carrying out risk assessment prior to undertaking any job.
- A tool box meeting prior to commencing any job.
- Donning correct PPE at all times.
- Being more vigilant towards any operation.
- Ability to identify all unsafe acts in the shipboard operation.
- Having a very strong self belief.
- Ability to avoid complacency.
- Actively prevent fatigue.
- Prevent coming under undue pressure.
- Be aware of time.

Leadership

Q.③ Explain effective communication & what are the tools for effective communication.

- Ans:-
- Effective communication is the process of exchanging ideas, thoughts, opinions, knowledge and data so that the message is received and understood with clarity.
 - For communication to be effective, it must be clear, correct, complete, short and understanding.
 - For effective communication, practise active listening & make your message as clear as possible.

The tools for effective communication are:-

- Make your message as clear as possible
- Active listening and understanding.
- Emotional intelligence
- Self confidence
- Strong belief in himself
- Respectfulness
- Non-verbal communication include gestures, facial expression, eye contact etc.
- Selection of the right medium
- Providing feedback

28/06/2022

Q. (7) Do you agree it is beneficial to be passive rather than aggressive? Justify (4 marks)

Ans:- Passive communication:

- It is not expressing your honest feeling, thoughts or beliefs, allowing other to violate your rights or you may violate your own right
- In this, person starts assuming how other may feel or react

Sign: • You apologise inappropriately.

- You believe its rude or selfish to say what you want
- You worry about embarrassing yourself.

But if cost you as: • Others take advantage of you.

- Repressing your anger or frustration can lead to inappropriate anger outburst
- Your self esteem can be impacted.

Aggressive communication:

- It is expressing your honest feeling, thoughts and beliefs in a way that violates the right of others.

Sign: • You debate, argue or try to get the other person to agree with you.

- You make complete image of the person instead of a specific behaviour they exhibit
- You express your opinion as fact

But if cost you as: • Other feel bitterness toward you

- You sometimes feel shame or guilt
- You are less likely to have healthy and stable relationship.

So, I do not agree that it is beneficial to be passive rather than aggressive. But on the other hand, I also not support to be aggressive. So the middle of passive & aggressive is **assertive** communication.

Assertive communication.

- It is expressing your thoughts, feelings and beliefs in an honest way without violating the rights of others.
- It is balance between violating other people right when aggressive and violating your own right when being passive.

Signs: • You use direct, non-threatening eye contact.

• You actively listen to other.

• You make the distinction between fact and your opinion.

• Your speech is steady, direct, relaxed and appropriate in volume.

Benefits: • Your self esteem will improve.

• Frustration and anger will be less likely to build up.

• Others will get to know what your true thoughts, feeling and belief are.

• You will get to know other more deeply.

Q.5 Explain the importance of management of

(i) Fatigue (4 times)

Ans: • Proper rest and sleep are vital to a person's physical and mental well-being.

• Those without proper rest and sleep are likely to make more mistakes and suffer from more accidents.

• You may fall asleep during on-duty hours which can lead to a major accident, if not well rested.

• Well rested team: are better able to manage workload.

are more creative

are more team focused

are more productive.

• Good management of fatigue, keep you happier and less stressed.

• Fatigue has a psychological aspect that means not having enough energy to do work, hence management of fatigue is important



- One of the most important benefits of management of fatigue is that it lower the rate of accidents that occur due to human error.
- It also increases the rate of productivity.

(ii) Motivation (5 times)

- Ans:-
- Increase productivity: Motivation meets the needs of the seafarer and thereby creates the drive to work to the best of his abilities.
 - Ensures organisational efficiency: Motivation plays an important role in changing the attitudes of seafarer on-board ship. The presence of such favorable attitude helps carrying out the shipboard operation safely and efficiently.
 - Ensures loyal workforce: Motivated seafarers have high levels of moral and commitment towards the operation & objectives.
 - Ensures a reactive workforce: Motivation helps seafarer in adapting with changing needs like night-time pilotage/berthing etc.
 - Builds confidence: If you are not motivated, you will not likely to build up the confidence in doing any operation.
 - Increase in motivation allows us to:
 - develop competencies
 - be creative
 - grow interest
 - make plans

Q.6) How would you motivate & educate you crew on-board for safe operation? (3 times)

Ans:-

Team working skill

Q. (7): Describe the essential qualities of team leader. (10 times)

- Ans:-
- (i) Clear communicator: Effective team leader communicate clearly. Effective communication allow leaders to present expectation to team member in a way crew can understand.
 - (ii) Confident in the team: An effective team leader is confident in his abilities, as well as confident in the abilities of his team member.
 - (iii) Respectful to other:- A quality team leader is respectful of his team members. A respectful leader encourage team member to offer ideas about decisions that affects them.
 - (iv) Fair and Kind: A quality team leader treats team member fairly. A fair leader ensures all employees receive the same treatment.
 - (v) Honest: An effective team leader is honest and open with his team member. A quality team leader does what he says he will do.
 - (vi) Strong organization skill: Organisation skills help team leader plan objectives and strategies, which allow team member to perform ideally.
 - (vii) Willing to delegate: Effective team member know how to share leadership through delegation. Delegating (transferring) certain task to trustworthy team member allow leader to focus on improving work place functions.
 - (viii) Influencer: Influential leaders inspire the team member for achieving the goals and objective. They also manage to change in workplace by making effective decision and gaining the trust of crew through communication.
 - (ix) Motivating others
 - (x) Embracing (accept) failure

Q. (8) Define team work. what are the advantage of team work.

- Ans:-
- Team work is the collaborative effort of a group to achieve a common goal in the most effective and efficient way.
 - Team work is selfless. It focused on the end goal.

The advantages of team work are:-

- Better problem solving
- As team works together and share their experiences and knowledge, they can come to strategic and creative solution.

- Increased productivity.
 - Personal growth will be enhanced by learning from someone else's mistake.
 - Less burnout by sharing the load.
 - Smarter risk taking
 - Fewer mistakes
 - Expanded creativity.
 - Gain fresh perspective.
 - Makes work more fun.
- # Expand each point by your own knowledge

Q.9) What is meant by resource management? Explain the key element of effective resource management. (3 times)

- Ans:
- Bridge resource management is the effective management and utilization of all resources, human and technical, available to the bridge team to ensure the safe completion of the vessel's voyage.
 - It is an important tool for improving safety in the maritime industry and thus prevent the recurrence of incidents.
 - It helps to support a safer and more efficient execution of operation by blending technical skills and human skills.

The key element of effective resource management are:

(i) Communication:

- The first important element of effective resource management is effective communication.
- It requires information to be conveyed when needed, understood and acknowledged by the receiver and clarified if needed.
- It is also important to maintain a common language on-board the vessel so that communication can become easier and quicker.

(ii) Teamwork

- The effective resource management focuses on team building and team work.
- Working in a team helps to address challenges faced by crew member on a daily basis.



What are four fundamental factors that contribute towards HARM on-board ship?

- A good team should anticipate dangerous situations and recognize the development of an error chain.

(iii) Decision making

- Decision making seems to be an individual matter. We all agree that the captain is the final authority on-board ship. But it is quite important for the decision maker to take valuable inputs from officers & crew members.
- It is therefore important to conduct regular meetings, interact with officers and crew members and take opinions from them.

(iv) Situational awareness

- Officers as well as crew members should be aware of the external and internal conditions that can affect ship safety.
- Mariners should keep their eyes and ears open and active at all times and be prepared for the unexpected.
- It is important to correlate what is going on in the present to what has gone on in the past and what may go on in the future.

(v) Fatigue

- Irregular sleep and poor rest causes distraction of mind leading to poor performance.
- Hence, it is important to manage crew's duty schedule to preserve their energy to have their clarity of mind during duty.

Q.5 SHIP SAFETY/ENVIRONMENT PROTECTION

(11) What is safety committee & what are its function (4 times)

- Ans:-
- In order to ensure that all officers and crew members are following all safety procedures while doing work and maintains a safe working environment a safety committee is formed on ships under the supervision of master.
 - The safety committee comprises of the safety officer along with other competent person
 - The safety committee works with goal of enhancing the safety standard on-board ship by ensuring that all safety procedures & practices are followed by all the officers and crew.

The function of safety committee are:-

- To ensure that safe working practices are followed on-board ship and are not compromised at any cost.
- To improve the standards of safety by enhancing safety-first attitude among crew member.
- To act as the representative of the crew to address concern and queries to the ship management.
- To take appropriate actions related to occupational health and safety policy.
- To make sure that safety meetings are held every 4 to 6 week or whenever need arise.
- To keep a record of safety meeting, suggestions, progress and action taken.
- To ensure that necessary safety tools and equipment are available to the crew member.
- To look into the accuracy of accident reports

(12) What are the agenda for monthly safety committee meeting?

- Ans:-
- Reviewing the matters arising from previous meeting.
 - Review of incident/casualty events if occurred
 - Review of any NEAR miss or risk assessment issue.
 - Review of occupational safety and health issues in relation to shipboard operation.

- Review of any on-board complaint issue.
- Review of crew performances last month.
- Review of any issues in relation to accommodation facilities, recreation facilities and food hygiene.
- Introduction of recent safety or security information.
- Motivate crew towards enhancing SAFETY FIRST attitude.

Q.2) What are the duties & responsibilities of ^{SHIP}safety officer and ^(SSO)safety representative on-board a vessel? (6 times)

Ans:- The duties and responsibilities of ship safety officer on-board ship are :-

- To survey the ship for any potential hazard which may affect the health and safety of the crew.
- Supervising and ensuring compliance with the SMS of the ship.
- Coordinating the safety measures to be maintained during cargo operation by collaboration with the port representative.
- To carry out a safety inspection at regular intervals (at least once in three months).
- Reporting to the master regarding any non-conformities.
- Enhancing the awareness with respect to safety on-board.
- Ensuring all officers and crew carried their job with a safety-conscious attitude.
- Imparting training to the shipboard personnel if needed.
- Look after and act on the complaints of the crew related to health & safety.
- Inform master regarding any deficiencies and ^{advise} approach ship master for removal of any potential hazard from the ship which may lead to an accident.
- If there is an accident involved, the SSO will lead the investigation and prepare a report.
- To maintain the records of all major and minor accidents.
- To make sure that all equipment associated with the ISM code and the SMS are tested, maintained and calibrated accordingly.
- To stop the ship operation if it directly affects the safety of the crew or the ship.

Q. ③:- How the safety of ship personnel is ensured by permit to work system?

- Ans:-
- Permit-to-work system is a method whereby safety procedures are specified in writing on a form issued to seafarer.
 - Permit should only be used for more hazardous tasks.
 - The form should describe the work to be carried out and its precaution.
 - The appropriate precautions should be written down in correct sequence.
 - The permit should contain a carefully planned checklist to identify, control or eliminate hazards.
 - The permit should also contain the emergency procedure to be followed in case of an accident.
 - A permit should be issued only by a competent officer.
 - The officer should ensure that all checks are being carried out properly & sign should be done only when satisfied that it is safe for the work to proceed.
 - The master will finally approve this permit.

Q. ④ With respect to risk assessment, explain (3 times)

(i) Hazard

- A hazard is any source of potential damage, harm or adverse health effects on something or someone.
- Basically, a hazard is the potential for harm or an adverse effect. Like for people hazard is a health effect.
- Hence, we require to carry out the risk assessment prior doing any job.
- By doing risk assessment, we identify hazards that have the potential to cause harm.
- The hazards can be of various category like biological, chemical, physical etc.
- The most common hazard on-board is safety like slipping/tripping hazards, equipment malfunction etc.

(ii) Risk

- Risk is the chance or probability that a person will be harmed if exposed to a hazard.

- It is not limited to person, it also apply to situations with property or equipment loss, or harmful effect on the environment.
- Risk is like a probability of getting affected where hazard is the agent responsible.
- For example:- there is a **risk** of developing cancer from smoking ciggarettes. & ciggarette is a **hazard** of developing lung cancer.
- By doing risk assessment, we analyze and evaluate the risk associated with the hazard.

(iii) Competent person.

- With respect to risk assessment, the competent person who have enough knowledge and skills in particular operation to analyze the hazards & risk associated with that task.
- The risk assessment should be carried out by competent person only.
- The competene person should ensure that all checks are to be carried out properly.

Q.5) Explain the need for a risk assessment on-board ship. (3-times)

Ans:- Three main reasons are as follows:-

- Because it is financially beneficial as it helps to reduce the risk and thus accident.
- Because it is a regulatory requirement as per the ISM code. and thus legally required to conduct risk assessment.
- Because it is morally and ethically right things to do, ^{as} risk assessment helps in preventing injuries and accidents.
- The whole need of risk assessment is to analyze that "Will it be safe to go ahead with an operation?".
- By doing so, we can reduce the potential impact of the risk.

write more points by your own.

Q.6 Explain the various proactive measures to be taken to **protect** marine **environment**. (3 times)

- Ans:-
- All marine operators should place garbage management system with proper stowage and segregation procedures for various categories of waste material such as plastic, batteries, food waste etc.
 - Companies should imply strict adherence to the MARPOL regulations and maintain zero dumping policy on-board their fleet.
 - Wastes such as plastic, metal, glass, batteries, medical waste, oily rags, sludge etc. those which cannot be disposed off at sea should be incinerated or given away to shore reception facilities.
 - Food waste can be discharged at sea but vessels to ensure complying with MARPOL annex V.
 - Reduce the production of oily waste and sludge by usage of clean and treated fuel which not only generate lesser sludge but also will be environmental friendly.
 - Plastic garbage bags should be replaced with marine bio-degradable bags for disposing off food waste.
 - Strictly adhere to the discharge criteria of oil or oily mixture as per the Annex I of MARPOL 73/78.

QUES NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

Ques no 1: As per code of safe working practice, precaution need to be taken for working overside or painting ship side/draft mark (5 times)

1. All equipment and ropes to be used for the job shall be thoroughly inspected.(Stages, Ropes used for fixing staging, ropes used as lifelines, Safety Harness, Work Vests, Lines used for securing tools and the Ladder).
2. Proper PPE shall be donned at all times.
3. Adequate non-skid shoes to be worn.
4. Ensure area is clear of any slipping hazard.
5. Harness and lifeline to be used at all times.
6. Lifebuoy to be kept ready.
7. Rescue boat shall be ready for immediate deployment.
8. All concerned personnel to be informed.
9. Safety Line connected to the safety harness must have only sufficient slack to allow for free movement of the personnel.
10. Weather / Vessels condition should be suitable for work.
11. Safety nets to be rigged were applicable.
12. Company-specific Working Aloft checklist to be complied with.
13. Follow safe practices as per COSWP.
14. Electrical connections shall be isolated prior to commencing work on electrical components and EIC to be issued.
15. Display notices/ placards prohibiting the operation shall be placed at all controls of Ships whistle, Radars, MH/HF device as applicable.
16. Sufficient personnel to attend the person working aloft at all times.
17. Whilst lowering any objects, safety lines/ buckets to be used.
18. Prior lowering any objects, ensure that all personnel in space are clear underneath.
19. If Painting is to be carried out within the jurisdiction of any port, approval must first be sought from the port Authorities.

Ques no 2: As per code of safe working practice, precaution need to be taken for working aloft (7 times) or funnel (5 times)

1. It must be ascertained that the work to be undertaken complies with the local port regulations;

QUES NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

2. A proper pre-meeting should be held before commencing the work and work permit should be obtained for the duration of the work; all concerned personnel to be informed.
3. Personnel under training shall not be assigned aloft or over side related jobs;
4. Personnel who are carrying out the work should be physically fit;
5. The personnel should be clearly instructed of work scope, procedure and precautions to be taken;
6. Personnel should be notified of working in vicinity of radar scanner, aerials and funnel & whistle;
7. Rolling period and wind speed must be taken into consideration to find out if the work can be carried out safely or not;
8. The power source to potential hazards such as ships whistle, radar, etc. should be isolated from their power source and accidental activation prevented by the use of warning signs and / or removal of fuses;
9. Traffic under the working site must be prohibited as far as possible by cordoning off to prevent injury to passerby due to falling debris / accidental dropping of objects;
10. Equipment to be used by the personnel working aloft or over side should be securely housed in tool belts / bags;
11. Tools / equipment that cannot be carried on a person should be hoisted to the place of work in secure containers;
12. All anti-falling measures for tools must be taken into consideration;
13. Personnel carrying out the work must wear all appropriate clothing and should be provided with adequate personal protective equipment;
14. Condition and strength of safety harnesses, lifelines, safety belts should be properly checked;
15. Equipment to be used must be correctly and properly rigged and measures must be taken to prevent damage by chafing;
16. Bosun chairs, stage boards, scaffoldings & ladders should be checked for good condition;
17. Condition and strength of ropes and lifelines must also be checked;
18. If portable ladders are used, it must be checked if they have been set correctly at suitable places;
19. Warning notices must be posted at proper places to avoid accident by use of such equipment during working;
20. Watchman must be posted where working crew is insufficient to take appropriate measures to prevent accidents;
21. Upon completion of the jobs, all equipment must be removed from the site and warning notices / isolated systems restored to normal condition; and
22. Concerned personnel must be notified of completion of the job.

Ques no 3: As per code of safe working practice, precaution need to be taken for entry into enclosed space (2 times)

The following are the points that need to be followed before entering an enclosed space:

1. Risk assessment to be carried out by a competent officer, as enclosed or confined space entry is deficient in oxygen, making it a potential life hazard.

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2. Risk assessment that needs to be carried out must include what work to be done, rescue operation to be followed etc.
3. Potential hazards are to be identified such as presence of toxic gases.
4. A list of jobs to be done should be made for the ease of assessment for e.g. if welding is to be carried out or some pipe replacement is to be done. This helps in carrying out the work quickly and easily.
5. Opening and securing has to be done and precaution should be taken to check if the opening of enclosed space is pressurized or not.
6. All fire hazard possibilities should be minimized if hot work is to be carried out. Emptying the fuel tank or chemical tank nearby the hot work place can do this.
7. The confined space has to be well ventilated before entering.
8. The space has to be checked for oxygen content and other gas content with the help of oxygen analyser and gas detector.
9. The oxygen content should read 20% by volume. Percentage less than that is not acceptable and more time for ventilation should be given in such circumstances.
10. Enough lighting and illumination should be present in the enclosed space before entering. As far as practicable lightings should be intrinsically safe.
11. A proper permit to work has to be filled out and checklist to be checked so as to prevent any accident which can endanger life.
12. Permit to work is to be valid only for a certain time period. If time period expires, a new permit is to be issued and checklist is to be filled out again.
13. Permit to work has to be checked and permitted by the master of the ship in order to work in confined space.
14. Duty officer has to be informed before entering the enclosed space.
15. Proper signs and “Men at work” sign boards should be provided at required places so that person should not start any equipment, machinery or operation in the confined space, putting life of the people at risk.
16. The checklist has to be signed by the person involved in entry and also by a competent officer.
17. One person must always be kept standby to communicate with the person inside the space.
18. The person may also carry a lifeline with him inside the enclosed space.
19. The person should carry oxygen analyser with him inside and it should be on all the time to monitor the oxygen content.
20. As soon as the level drops, the analyser should sound the alarm and the space should be evacuated quickly without any delay.

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21. No source of ignition has to be taken inside unless the master or competent officer is satisfied.
22. The number of persons entering should be constrained to the adequate number of persons who are actually needed inside for work.
23. Rescue equipment is to be present outside the confined space. Rescue equipment includes breathing air apparatus and spare charge bottles.
24. Means of hoisting an incapacitated person should be available.
25. After finishing the work, when the person is out of the enclosed space, the after work checklist has to be filled.
26. The permit to work has to be closed after this and responsible officer notified of the completion of the work

Ques no 4: As per code of safe working practice, precaution need to be taken prior doing hot work on main deck of cargo ship (7 times)

Following procedure to be followed for carrying out hot work maintenance on ships:

1. Refer and follow "Hot Work Precautions Matrix" before starting the job;
2. A work planning meeting to be held and a formal or informal risk assessment to be carried out of the work place;
3. A responsible officer, who is not directly involved in the hot work, must be designated to ensure that the plan is followed;
4. The atmosphere of the hot work area should be tested and found to be less than 1% LEL;
5. Firefighting equipment must be arranged and kept ready for immediate use;
6. Fire detectors of the work place must be checked for proper working;
7. Measures should be taken to prevent scattering sparks, such as spark shelters;
8. Confirm that no other work such as repairing pipelines, that may cause leak of combustible gas or oil, is being done in the same compartment;
9. Arrangements for placing required watchmen for monitoring hot work area and adjacent areas should be made;
10. Provision must be made for sufficient ventilation and lighting;
11. Evacuation routes/passages must be properly designated/secured;
12. The condition of tools and equipment must be checked and found satisfactory;
13. Personnel involved in work must be provided with appropriate personal protective equipment and danger indications, safety ropes etc. installed at work site as necessary;
14. Areas where fire is directly applied must be clearly marked;
15. All crew engaged in the hot work should be adequately trained and clearly instructed in precautions to be observed when carrying out hot work;
16. Measures must be taken to prevent fire from coming in contact with gas, residual oil, sludge and other dangerous and combustible materials;
17. Check there is no dangerous and combustible materials on the other side of the bulkhead, deck head or division on which hot work is to be carried out;

QUES NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

Ques no 5: As per code of safe working practice, precaution need to be taken when welding repair is to be carried out (2 times)

- **Secure Gas Cylinders in Vertical Position:** Compressed gas cylinders must be handled with utmost care and always be secured in vertical position even if they are full or empty. Full and empty cylinders to be segregated and marked clearly.
- **Store in Right Spaces:** Never store oxygen and acetylene cylinder together in one space whenever possible. Keep them separately in well ventilated spaces. Ensure when not in use, their caps should always be on them.
- **Keep Grease and Oil Away:** Control valves and fittings should be kept free of oil and grease. Never operate cylinder valves and parts with oily and greasy hands.
- **Ensure Flame Arresters Are Properly Fitted:** Ensure non-return valves and flame arresters are fitted in the acetylene and oxygen cylinder lines. One flame arresters is normally fitted in the low pressure side of the regulator near cylinder and other near the torch.
- **Keep Pressure of Oxygen Higher:** When performing gas welding, ensure the pressure of oxygen is always higher than the acetylene to avoid acetylene going back to the oxygen line.
- **Handle Acetylene With Care:** Acetylene should not be used for welding at a pressure exceeding 1 bar of atmosphere gauge as it is liable to explode, even in the absence of air, when under excessive pressure.
- **Rectify Cause of Backfire:** In case of back fire, the first priority should be to close the oxygen valve and then immediately close the acetylene valve. No operation is to be performed until the cause of backfire is rectified.
- **Handle Flashback Carefully:** In case of flashback or explosion of the gas pipes, first action must be to isolate the cylinder valves for both the cylinders. Further action to be taken as per ship's fire drill procedures.
- **Ensure Proper Connections:** The connections between the hose and blowpipe and between hoses should be securely fixed with fittings to comply with Regulatory Standard.
- **Keep a Steady Watch:** A regular watch to be kept on the temperature of acetylene cylinder. If the temperature is elevating, it is to be considered same as flashback or explosion situation for taking action.
- **Prevent Interchange of Hoses:** Manifold hose connections including inlet and outlet connections should be such that the hose cannot be interchanged between fuel gases and oxygen manifolds and headers.
- **Replace Old and Faulty Hoses:** Any hose in which flashback has occurred must be replaced with new one.
- **Handle Hoses Properly:** While performing the job, the hoses should be laid properly and kept out of any moving machinery, sharp corners, high temperature areas etc. Ensure they are not dangled, knitted or tipped over.

Ques no 6: As per code of safe working practice, precaution need to be taken during mooring/unmooring

Mentioned below are ten points that must be considered while handling mooring operation on ships:

- 1. Don't Allow Any Extra Crew Member on the Deck:** Ensure that no extra personnel are present at the mooring station except those who are involved in the operation. Anyone who is not assisting in the mooring operation must be asked to leave the mooring station for his/her and other's safety.
- 2. Consider Weather Condition:** Before planning the mooring operation, consider the weather condition by taking factors such as wind and current. The ship's master and responsible officer must have the details of current and future weather data before commencing the mooring operation.
- 3. Have knowledge of Snap Back Zone and Rope Bight:** All personnel involved with the mooring operation should be aware of the snap back zones and rope bight.
- 4. Check All the Mooring Equipment:** Check all the equipment (mooring winch, drums, windlass etc.) involved in the mooring operation for any kind of problem. Proper routine maintenance is the key to ensure smooth running of mooring equipment and systems. Don't forget to check the load sensors of mooring winches.
- 5. Check the Tail of Mooring Line:** If the mooring wire line is provided with tail (short lengths of synthetic fibre rope which are placed in series with the vessel's winch-mounted wires to decrease mooring line stiffness and thus to reduce peak line loads and fatigue due to vessel motions) ensure same size and material of tails are used for all lines in the same service (breast, spring and headlines). Different tail size and material would lead to uneven load in the mooring line.
- 6. Tend One Line at a Time:** Only one line should be tended at a time during mooring operation. If this is not done, it may increase the load in the other tended lines. If two lines are tended together it may lead to overloading and breakage. Follow the orders of the master or responsible ship officer properly to avoid any kind of mishap.
- 7. Keep a Check on the Mooring Line Load:** Ensure that the allowable breaking load in any of the mooring lines does not increase 55% of its Maximum Breaking Load (MBL). This is to prevent the line from breaking.
- 8. Keep a Continuous Check:** Load on the mooring lines must be checked continuously even after the mooring operation is over. If there is any change in the ship's ballast condition, the lines must be slacked or tightened accordingly. The condition of the rope material should also be checked to foresee unfortunate accidents.
- 9. Avoid Mixed Mooring:** Mixed mooring is extremely dangerous. Generally, mooring lines of the same size and material should be used for all leads, if this is not possible due to the available equipment, all lines in the same service, i.e. breast lines, spring lines, headlines and stern lines should be of the same size and material.
- 10. Arrange Mooring Lines Symmetrical:** All mooring line must be arranged as symmetrical as possible with the breast line. The breast line should be perpendicular to the longitudinal centreline of the ship and the spring line should be parallel to the longitudinal centre line.

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Ques no 7: As per code of safe working practice, precaution need to be taken while at anchor station

1. Presence of crew members wearing proper [personal protective equipment](#) (PPE) for assisting the anchor station
2. Confirming the anchor used for the operation (Port or Starboard)
3. The anchor lashings and bow stopper are removed prior commencing the operations
4. When using hydraulic windlass, make sure the pumps are started prior operation
5. Check the [working of Windlass](#) and its controls
6. If [bow thrusters](#) are likely to be used during anchoring, ensure that the required ventilations are open
7. Anchor day signal (ball) is ready for hoisting after terminating the operation
8. Walkie-talkies radios to be checked
9. Ensure that ship sides are clear of obstructions
10. Keeping a track on how many shackles are lowered

Ques no 8: As per code of safe working practice, precaution need to be taken while rigging pilot ladder

Here are few points to consider while rigging the pilot ladder:

1. The top portion or head of the pilot ladders should be secured at the strongest point of the vessel.
2. Pilot ladder should be positioned and secured, so that it is clear of any discharges from the ship, with parallel body length of the ship and as far as practicable within the half way length (amidships) of the ship.
3. All steps of the pilot ladder should rest firmly against the ship side. In certain ships, where constructional features such as fenders or rubbing band prevent the implementation of

QUES NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

above safety features, special arrangements are to be made for safe embarkation and disembarkation.

4. Two man ropes not less than 28 mm and made of manila rope or other material which gives firm grip for climbing the ladder, should be rigged along the side of pilot ladder if requested.
5. During night, the whole length of the pilot ladder, point access and egress should be well illuminated. A life buoy with self-igniting light and a heaving line should be kept ready. Hand hold stanchions and bulwark ladder are to be used if required.
6. If the point of access from sea level is more than 9 meters, a combination ladder should be used. A combination ladder is a conjunction of pilot ladder and accommodation ladder. This is a common arrangement found on vessels with high freeboard. The accommodation ladder is rigged in such a way that it leads aft of the vessel and has a slope angle of not more than 55 degrees.

Ques no 9: As per code of safe working practice, precaution need to be taken while rigging MOT ladder (2 times)

1. The MOT Ladder/gangway must be properly rigged and deployed.
2. It must be safe to use and adjusted as necessary to maintain safe access to the vessel.
3. MOT Ladder/gangway adequately lit at all times, with a minimum of 20 lux at a height of 1m.
4. A lifebuoy with self-activating light and buoyant line must be posted adjacent to the MOT Ladder/gangway.
5. The MOT Ladder/gangway MUST NOT be used at an angle greater than 30° above the horizontal plane unless it is specifically designed for operation at greater angles, normally up to 50°.
6. Where necessary a bulwark ladder must be provided, safety fenced to a minimum height of 1m.
7. Guard ropes must be kept taut at all times and stanchions must be rigidly secured.
8. The MOT Ladder/gangway must be kept clear of cargo operations and quayside obstructions.
9. The MOT Ladder/gangway must be kept clear of any materials, substances or obstructions likely to cause a person to slip or trip.
10. A safety net should be mounted where a person may fall from the MOT Ladder/gangway, ship's deck or quayside.
11. The aim of the safety net is to minimize the risk of injury arising from falling between the ship and the quay or falling on to the quay or deck and as far as reasonably practicable the whole length of the MOT Ladder/gangway should be covered.
12. Safety nets should be securely rigged, with use being made of securing points on the quayside where appropriate.

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Ques no 10: As per code of safe working practice, precaution need to be taken while embarkation of pilot (4 times)

1. The access area shall be kept free and clear at all times and can also be marked with permanent signs
2. The pilot ladder should be checked after it is rigged preliminary to ensure it is properly secured to the ship by a crew member by descending few steps. While doing so safety should not be jeopardised. The crew member should always take care of their own safety by wearing a life jacket and a lifeline if appropriate
3. The duty officer should closely monitor continuously and observe the pilot all the time while he is on the ladder. He should always remain in contact with the bridge via walkie talkie, report every event and inform the bridge at once on the safe arrival of a pilot onboard
4. A canvas bag or net and a rope should be kept ready at the embarkation position to hoist aboard any baggage the pilot might have with him
5. A pilot dedicated lifebuoy with water actuated automatic light and lifeline should be readily available
6. If a retrieval line is being used, care should be taken that it does not hinder the pilot nor obstruct the safe approach of the pilot boat.
7. At night the access area should be well illuminated to facilitate safe boarding and debarking
8. A spare ladder should always be available onboard
9. Pilot ladders remain the most efficient way for pilots to board vessels. The transfer of a pilot between the pilot boat and ship is a significant risk that needs to be carefully managed
10. Periodic inspection of the boarding arrangement, especially the pilot ladder should be an ongoing process and should be inculcated into the planned maintenance system onboard ships
11. Each pilot ladder, accommodation ladder and its associated equipment should be properly checked and stowed after every use.
12. Ropes should also be checked for any kind of deterioration.

QUES NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

Ques no 11: As per code of safe working practice, precaution need to be taken for changing navigational bulb in bad weather (3 times)

1. Prepare the work permit
2. Put the lock out tag and inform the officer who is on duty
3. Try to do the routine maintenance when the ship is in the port
4. Before climbing up the main mast, take the working aloft permit
5. Switch off the radars and take out the fuses
6. Disable the power supply of the nearby ship whistle
7. Switch off any other communication devices as the antennas, which are usually located near the mast, generate radiations harmful for humans
8. While working on navigation lights at sea, check the wind flow meter for wind speed and direction. If the wind is heavy avoid climbing on the mast
9. Check for rolling and pitching of the ship. If it's too much, don't climb the mast

Ques no 12: As per code of safe working practice, precaution need to be taken for handling and taking care of batteries on ships (2 times)

1. **Compartments in which batteries are kept should be well ventilated** to prevent any buildup of dangerous and flammable toxic gases.
2. **A conspicuous label stating "No Smoking/No Naked Lights" should be displayed on the outside** of the door leading into the compartment as well as inside the compartment so that the personnel makes no mistakes
3. **The compartment for the storage of batteries should be strictly used** for the purpose of storing batteries and nothing else. For example, other pieces of lights and scraps such as NUC or RAM lights must not be lying around
4. **The light bulbs in the compartment must be protected by gas tight enclosures** and all the wiring leading into the lights must be well insulated and not a messy bunch

QUES NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

5. **All battery connections must be clean** and neat and tight
6. **Batteries must be securely stowed** in their position
7. **Metal tools must be squared up** and not left lying on top of the batteries as they may lead to short circuits
8. **Because the presence of metals in contact with batteries might lead to a mishap**, rings should not be worn by personnel when working with batteries as they may cause burns
9. **Whenever the batteries are moved**, especially really big ones, they should be carried horizontally. In case of really heavy battery, sufficient personnel must be assigned for the carriage of the same. The liquid solution within the batteries might cause corrosive injuries and even damage the clothing, hence utmost care while handling them is important
10. **The battery compartment** must be kept locked to prevent inadvertent use and the key safely placed in a box outside

Ques no 13: As per code of safe working practice, precaution need to be taken for purging & gas freeing on oil tanker (3 times)

1. Ensure Proper Maintenance of Inert Gas Safety Devices is Carried Out
2. Ensure Adequate Oxygen Level

3. Ensure There are no Combustible Gases

An important point to note is that the inert gas does not affect the toxicity of hydrocarbon gases and thus the latter can be extremely dangerous (as it is flammable).

4. Remove Toxic Components of Flue Gases

An approved combustible gas indicator should be used to measure the presence of flue gases in the tank. Flue gases contain sulphur dioxide, carbon monoxide and nitrogen which need to be properly measured during the gas freeing process.

5. Check Tank Pressure

QUES NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

Check the tanker pressure before opening any tank lids, ullage plugs or tank washing openings. Inerted cargo tank pressure must be adequately reduced before opening any tank.

6. Prevent Air From Entering the System

In the event of an inert gas system failing to deliver the required quality and quantity of inert gas, or is not able to maintain a positive pressure in the cargo tanks, action must be taken immediately to prevent air from being drawn into the tanks.

7. Take Measures to Prevent Electrostatic Ignition

The presence of hydrocarbons in the tanks can be dangerous. If the tank atmosphere contains flue gas, which has small particulate matter containing a small electrostatic charge, there is a possibility of an electrostatic ignition when the oxygen content of the tank rises due to the ingress of air.

8. Ensure Proper Functioning of Blowers

Generally on oil tankers, blowers are used for gas freeing and hence an air inlet (suction from the atmosphere) at the suction side of the blower with blanking arrangement must be provided.

Ques no 14(a): Precaution need to be taken while bunkering (6 times)

1. Responsibilities of each officer are explained
2. Sounding is taken before bunkering and record is made
3. A checklist is to be filled so that nothing is missed
4. All deck scuppers and save all trays are plugged
5. An overflow tank is provided in the engine room which is connected to the bunker tank and bunker line. Ensure the overflow tank is kept empty to transfer excess fuel from the bunker tanks
6. Adequate lighting at the bunker and sounding position are to be provided
7. No smoking notice should be positioned near the bunkering station

QUESTIONS NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

8. Onboard communication, signs, and signals to stop the operation between the people involved in bunkering are to be understood by all the crew involved in the operation.
9. Red flag/light is presented on the masthead
10. Opposite side bunker manifold valves are closed and appropriately blanked
11. All equipment in [SOPEP\(shipboard oil pollution emergency plan\) locker](#) are checked and kept near the bunkering station
12. The pumping rate of the bunker fuel is agreed with the bunker barge/ bunker truck
13. The hose is then connected to the manifold. The condition of the hose must be checked properly by the ship staff and if it is not satisfactory, same to be notified to the chief engineer
14. Most of the bunker supplier send there crew to connect the bunker oil pipeline coming from bunker ship/ barge. The ship staff must recheck the flange connection to eliminate the doubt of any leakage
15. Once the connection is made, the chief engineer will ensure all the line valves which will lead the bunker fuel to the selected bunker tanks are open, keeping the main manifold valve shut
16. Proper communication between the barge and the ship is to be established
17. Sign and signals are to be followed as discussed in case of communication during an emergency
18. Most bunkering facilities (ship/ barge/ terminal/ truck etc.) provide an emergency stop switch which controls the bunkering supply pump. Ensure to check its working before commencing the operation
19. Once all the checks are done, the manifold valve is open for bunkering
20. During the start of the bunker, the pumping rate is kept low
21. After confirming the oil is coming to the proper tank, the pumping rate is increased as agreed before
22. During bunkering, sounding is taken regularly and the frequency of sounding is more when the tank is near to full.
23. Once the bunker is finished, it is a general practice to air blow the bunkering supply line for discharging all the oil trapped in the pipelines. At this stage, ensure all sounding pipe caps are closed and keep a watch on those storage tank vents which are at its maximum limit.
24. After everything is settled, the hose connection is removed

QUES NO 6. SAFE WORKING PRACTICE/ CHECKLISTS

(14.b): Immediate action to be taken in case of oil spill while bunkering (6 times)

Immediate actions on oil spill during bunkering will be as follows:

1. Sound the emergency alarm.
2. Initiate emergency shutdown, stop all transfer and bunkering operations, close all valves and inform the barge or terminal.
3. Inform the master and initiate the emergency response procedures.
4. Inform the port or local state authority.

Follow up Actions on oil spill during bunkering:

1. Identify the source of spill or leak and initiate measures to stop or minimize the overflow.
2. Drain or transfer the oil from affected area of the pipeline into empty tanks taking into account stress and stability of the vessel at all times.
3. If there is a possibility of release of flammable vapors or its entry to the accommodation, engine room or cargo holds, ventilations to these areas must be shut off.
4. Clean up operations must be started using the equipment available onboard.
5. All spilled oil that is collected must be carefully stored onboard till it can safely be disposed off.
6. No chemical or dispersant to be used if there is a possibility of them going into the water unless prior permission has been obtained from the port authority.
7. Oil gone overboard should be contained so that it will not spread and oil dispersants to be used after getting permission from local authorities.
8. After the spill has been completely brought under control, oil spilled overboard and onboard ship has been removed and the cause of spill ascertained and corrective actions taken, the vessel can resume bunkering operation.
9. The chances of recurrences must be completely eliminated before starting bunkering.
10. Before resuming bunkering, permission from port or local authorities must be taken.
11. All incidents and corresponding actions to be recorded as it is required for further litigation purposes.

Ques 15: There is a fire in Engine Room. Describe the procedure to fight it.

1. Raise the alarm
2. Inform the master
3. Reduce the vessel's speed and engage manual steering
4. Display not under command light, weather report, open communication with other vessels in the vicinity and send urgency signals
5. Close all ventilation, fire and water tight doors Muster all crew take a headcount
6. Emergency fire pump running
7. Isolate all electrical units
8. Commence boundary cooling
9. Fight fire by conventional means
10. Main fire party to be properly equipped & back up party ready at all times
11. C/O should not to enter as he monitor progress and communicate with the bridge
12. Proper communication between bridge and engine room
13. Keep bridge informed accordingly of sequence of events
14. At all time firefighters to be well-equipped with breathing apparatus and firemen suit
15. Check on apparatus must be carried out prior to entering a space