(Paper Format)

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIPS & CARE FOR PERSONS ON BOARD
(Management Level)

PAPER: NAVAL ARCHITECTURE PAPER - I

TIME: 3 Hours PASS MARKS: 120 MAX. MARKS: 200

Notes:

1. All questions in Part A are compulsory. and carry 30 marks each
2. Attempt any four out of five from Part B. (Each question carry 20 marks)
3. Wherever applicable, sketches should be drawn to support the answer.

Questions based on

15.1.1 Ship Construction

- Welding: Down hand vertical and overhead welding, butt, lap and fillet welds, chain and intermittent welding, weld faults, tests of welds, electric arc welding, TIG and MIG.
- Bulkheads: Transverse bulkheads and racking stresses, margin line, weather tight, rule regarding penetration of collision bulkhead, testing of bulkheads for tightness.
- Watertight and weather-tight doors: Water tight and weather tight doors, categories of watertight doors, rules regarding water-tight doors.
- Corrosion and its prevention: meaning of corrosion, types of corrosion, galvanic actions, cathodic protection, structure of paints, preparing a surface for painting.
- Surveys, certification & dry-docking: Frequency of classification society surveys, items to examine in dry dock, cleaning preparation and painting of the hull in dry dock. Surveys and certification including Harmonised Ship Surveys and Enhanced Surveys, Condition Assessment Scheme and Condition Assessment Programme.

15.2.1 Ship Stability

- Approximate calculation of areas and volumes: Simpson's rule to calculate areas, volumes and centroids.
- Effects of density: TPC, FWA, DWA calculations
- Calculation of free Surface effect
- Simplified stability data: Stability information supplied in simplified form, use of diagrams of dead weight moment.
- Trim and list: LCG, LCB and relationship with trim, trimming moment, loading a given mass to produce a required trim, loading a mass to keep the aft draught constant, correction of draughts, forward aft and mid-ship.
- Dynamical stability: Definition of dynamical stability and calculation of same.
- Intact stability requirements for carriage of the grain
- Dry-docking and grounding: Virtual loss of GM due to dry docking and grounding, calculation of residual GM and draft.

PART A

Q. 1 Ship Stability- Numerical *(Application of Simpson's Rules, Grain Stability)*

Q.2 Ship Stability- Numerical *(Trim, Dry-docking, Grounding with fixed data)*

Q.3 Ship Stability- Numerical based on Ship Stability Booklet *(List, Trim, Dry-docking, Grounding, Intact stability requirements)*

Q.4 Ship Construction- Sketch

(Construction of W/T bulkheads and its attachments to sides and tank top, How water tightness is maintained when bulkheads are pierced by longitudinal, beams or pipes, Arrangement of power operated sliding W/T door, Hinged W/T door and means of securing them, Ramp doors of Ro-Ro ships, Ship side doors)

PART B

Q.5 and Q.6 Ship Stability/ Ship Construction- Theory

(Ship Stability: Effect of density on trim, Effect of beam, freeboard and length on GZ curves, Effect of shift of weight on GZ curves, Dry-docking

Ship Construction: Rules and Regulations for Bulkheads, Watertight doors, Condition Assessment Scheme and Condition Assessment Programme)

Q. 7 Surveys and Certificates

Q. 8 Welding *(Types, Faults, Tests)*

Q. 9 Corrosion/ Painting

Please note that the above format is only an indicative of the examination paper. The candidates are advised to refer to detailed teaching syllabus and the course outline.

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GOVERNMENT OF INDIA

PM Paper **Date: - 8th Jan-2025**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 M.V. Hindship Displacement 12927 T, KG 7.850 m FSM 1290 TM, is trimmed 0.70m by the stern. She has to be dry-docked. Calculate:
(a) Virtual GM of the vessel when her keel takes the blocks all along the length of the vessel.
(b) Draft F and A when she sits overall on the blocks.

Q.2 A vessel of L 148 m, LCF 70 m, draft forward 8.00 m, draft aft 9.80 m, TPC 32, MCTC 264 lightly grounds on gently sloping seabed. Soundings taken in that instant showed forward depth as 8.00 m and aft depth as 10.9 m. Find the draft after tide falls by (a) 30 cm (b) 2.00 m

Q.3 A ship with lightship displacement 1,700 tonnes, KG 3.5m is loaded with 1,800 tonnes of cargo at KG 3.8m. KM after loading is 3.8m, while KN values are as follows:

Displacement (tonnes)	10°	20°	30°	40°	60°	75°
3,000	0.75	1.50	2.16	2.84	3.19	3.26
4,000	0.77	1.54	2.30	2.92	3.25	3.26

Plot the GZ curve and show if the ship conforms to IMO stability criteria.

Q.4 Explain why the values of trim and metacentric height in the freely afloat conditions are important when considering the suitability of a vessel for dry-docking.

PART – B

Q.5 With reference to the International Code for the Carriage of Grain in bulk explain:
a) Intact stability criteria as applicable to ships carrying grain in bulk.
b) Volumetric heeling moments and its effect on stability.

Q.6 Discuss the effect of change in Beam and Freeboard on the GZ curve of the ship.

Q.7 (a) Explain what is "Close up inspection" and "Critical areas" with reference to Enhanced Survey programs. Describe the contents of "Documents File."
(b) Write short notes on Condition Assessment Scheme (CAS).

Q.8 Describe the faults that can be found in welds and describe the methods of testing of these faults.

Q.9 (a) Sketch and describe Impressed Current Cathodic Protection system used on ships.
(b) Compare the merits and demerits of Cathodic protection system by sacrificial anodes and ICCP system.

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GOVERNMENT OF INDIA

AM Paper **Date: - 8th Jan-2025**

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)
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PAPER: - NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. **All questions in Part A are compulsory and carry 30 marks each.**
2. **Attempt any four out of five from Part B (Each question carries 20 marks).**
3. **Wherever applicable, sketches should be drawn to support the answer.**

PART – A

Q.1. A vessel of displacement 29,000 t, length 200m, Fwd draft 7m and Aft Draft 8.5m runs aground without any damage to her hull. Her MCTC 250 tm/cm and TPC 20 t/cm, LCF 105m, FSM 1000 tm, KM 8.5m, KG 7.8m. Tide then falls by 50 cm. The drafts then observed were to be Fwd 7.8m and Aft 7.5m. Calculate with reference to COF:
(a) The location where the grounding occurred.
(b) The residual GM.

Q.2. MV Hindship has to load at 2 different ports, each port a consignment of 1000t. The 1st port is in SW where she arrives with draft Fwd = 7m and aft = 8m; Space is available in no. 2 tween deck and no. 5 hold. How should the cargo be distributed at 1st port so that she arrives at even keel draft in 2nd port which is a FW river port? What will be her arrival draft at 2nd port assuming there was negligible consumption of FW and bunkers?

Q.3. Three ordinates of a deck spaced at equal distance of 20m, and commencing from forward are 7.5m, 11.8m and 15.8m respectively. Calculate:
(a) The positions of geometric center of the areas between the first two and the last two ordinates with reference to fwd end.
(b) Amount of cargo that can be loaded on the deck area between first two ordinates, if the load density of deck is 10t/m².

Q.4 Sketch and label a power-operated horizontal sliding watertight door. Describe its method of achieving water-tightness on passenger ships.

PART – B

Q.5) With suitable sketches, explain the following:
(a) Block Coefficient (CB) (b) Water Plane Coefficient (CW) (c) Midship Coefficient (CM)
(d) Prismatic Coefficient (CP) (e) Dynamical stability of vessel.

Q.6 Describe the objectives and main features of the harmonized system of surveys and certification, and list various certificates covered by this system.

Q.7 Why and how does the trim of a vessel change when she goes from:
(a) SW to FW (LCB > LCF) (b) FW to SW (LCF > LCB)

Q.8 Describe the principle of cathodic protection system against corrosion. Explain various methods used on board merchant vessels.

Q.9 (a) Describe various types of defects that could be found in welded joints, with sketches as relevant.
(b) Also explain their causes and how they can be minimized.

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GOVERNMENT OF INDIA

PM Paper **Date: - 1st Oct-2024**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 M. V. Hindship sailed from port in condition No. 8 soon after departure she grounded on an isolated rock, without damage to her hull. The drafts then were observed to be F 5.90m, A 9.30m. Calculate the following:
i) The upthrust provided by the rock
ii) The position with respect to AP, where the grounding occurred.

Q.2 A vessel of L 148 m, LCF 70 m, Draft forward 8.00m, draft aft 9.80m, TPC 32, MCTC = 264 lightly grounds on gently sloping seabed. Soundings taken at that instant showed forward depth as 8.00 m and aft depth as 10.9m. Find the draft after tide falls by (a) 30 cm (b) 2.00 m.

Q.3 M.V. 'Hindship' berthed in a dock where RD of water is 1.007, at a draft of F: 7.87m, A 8.32m, KG 7.45m. FSM 970 mt. She discharged 410 t of cargo from 2TD. A 60 t case is shifted from deck, Kg 14.7m, LCg 58.6m to No. 2 Hold. 110 t water kg 2.77m, LCg 16.23m was received in No. 8 (P & S) tanks, filling them completely. Calculate the draft F & A at which she would sail from the dock.

Q.4 Draw and label all parts of a transverse plane watertight bulkhead showing its attachments to sides and tank top.

PART – B

Q.5 With reference to the International Code for the Carriage of Grain in bulk explain:
a) Intact stability criteria as applicable to ships carrying grain in bulk.
b) Volumetric heeling moments and its effect on stability.

Q.6 a) Write short notes on: i) Water tight ii) Weather tight iii) Oil tight
b) Describe testing requirements of main W/T compartments on cargo ships.

Q.7 a) Explain what is 'Close up inspection' and 'Critical areas' with reference to Enhanced Survey programs. Describe the contents of 'Documents File'.
b) Write short notes on Condition Assessment Scheme (CAS)?

Q.8 List the causes and remedies for the following types of weld defects:-
i) Lack of fusion ii) Incomplete penetration and iii) Undercutting
What is the purpose of flux in welding?

Q.9 a) Sketch and describe impressed Current Cathodic Protection system used on ships.
b) Compare the merits and demerits of Cathodic protection system by sacrificial anodes and ICCP system.

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GOVERNMENT OF INDIA

AM Paper **Date: - 1st Oct-2024**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. **All questions in Part A are compulsory and carry 30 marks each.**
2. **Attempt any four out of five from Part B (Each question carries 20 marks).**
3. **Wherever applicable, sketches should be drawn to support the answer.**

PART – A

Q.1. A ship, floating at drafts of F 7.7 m and A 7.9 m, sustains damage in an end on collision and has to lift the bow to reduce the draft forward to 6.7 m.

The ship is about to enter a port in which the maximum permissible draft is 8.3m. To do this it is decided to discharge cargo from No. 1 hold (Cog 75 m For'd of amidships) and No. 4 hold (CoG 45 m aft of amidships). MCTC 200 tonnes m, TPC 15 tonnes. Centre of flotation is amidships. Find the minimum amount of cargo to discharge from each hold.

Q.2. M.V. 'Pilot', is loaded up ready for departure, KG is 6.55m, FSM 1350 Tm, with a displacement of 9,000 T. From the Cross curves of stability, the KN values are as:

HEEL	0°	15°	30°	45°	60°	75°	90°
KN	0	1.98	4.10	5.92	6.82	6.98	6.58

Construct the Statical stability curve for this condition and determine the following range of Stability. Change of above range when transverse upsetting moment of 2250 Tm is caused Moment of statical stability at 5° Heel.

The maximum GZ and Angle at which it occurs

Dynamical stability at 45°

Q.3. A box shaped vessel 180m long, 28m broad and 6m draft even keel, KG 6.0m. Cargo of 1200 Ts is loaded with LCG of 80m and KG 4.5m. Find the draft forward and aft after loading.

Q.4 With neat sketches, discuss the effect of Change in Density of the water in which ship is floating on the Trim.

PART – B

Q.5) Explain: a) Critical Period b) Critical Instant c) Declivity

Q.6 a) Explain SOLAS regulations of piercing of Collison Bulkhead.

b) Sketch and label a transverse corrugated watertight bulkhead.

Q.7 a) Explain process of preparing for Safety equipment survey of your ship.

b) Explain the need for vessels to undergo CAP Survey.

Q.8 a) Explain corrosion cell with regards to galvanic corrosion.

b) Sketch and describe an Impressed Current Cathodic Protection System (ICCP).

Q.9 Describe the faults that can be found in welds and describe the methods of testing of these faults.

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GOVERNMENT OF INDIA

PM Paper **Date: - 9th July-2024**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 M. V. Hindship displacing 9500 t and trimmed 0.80 m by stern is to be dry-docked for bottom inspection. KG = 7.92 m, FSM= 1600 tm. Calculate:

a) The GM (F) of the vessel before entering the dry-dock.

b) The virtual GM of the vessel when her heel taken blocks all along the length of the vessel.

Q.2 The water plan areas of a ship from Forward drafts mentioned are as follows: 5m: 6380, 4m: 6320, 3m: 6255, 2m: 6090, 1m: 5885, 0.5m: 5740, 0:5560. Find the displacement and KB at 5 m draft.

Q.3 A ship has displacement 15000 MT KG – 7.0 M.

Heel	0	15	30	45	60
GZ	0	0.38	1.0	1.41	1.2

The vessel has loaded to this displacement but the KG is found to be 6.8m. Draw the amended GZ curve and estimate the dynamical stability at 60^{O}.

Q.4 a) What are the different functions of watertight bulkheads?

b) How these bulkheads are attached to the sides, top and bottom of the ship's structure?

PART – B

Q.5 For which type of ship is "The Enhanced system of survey" compulsory? Briefly describe the system.

Q.6 Describe the SOLAS requirements for a transverse watertight bulkhead of a cargo ship:

a) Minimum number b) Location c) Initial tests

Q.7 Describe the process of gas wielding, with the help of a neat diagrams.

Q.8 With reference to the International Code for the Carriage of Grain in bulk explain:

a) Intact Stability criteria as applicable to ships carrying in grain in bulk.

b) Volumetric heeling moments and its effects on stability.

Q.9 i) What is the objective of surface preparation prior to painting? List the methods of surface preparation?

ii) With the help of a neat diagram, explain the ICCP method of corrosion prevention on board ships.

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GOVERNMENT OF INDIA

AM Paper **Date: - 9th July-2024**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. **All questions in Part A are compulsory and carry 30 marks each.**
2. **Attempt any four out of five from Part B (Each question carries 20 marks).**
3. **Wherever applicable, sketches should be drawn to support the answer.**

PART – A

Q.1. A ship, floating at drafts of F 7.7 m and A 7.9 m, sustains danger in an end on collision and has to lift the bow to reduce the draft forward to 6.7 m. The ship is about to enter a port in which the maximum permissible draft is 8.3m. To do this it is decided to discharge cargo from No. 1 hold (centre of gravity 75 m forward of amidships) and No. 4 hold (centre of gravity 45 m of amidships). MCTC 200 tonnes m, TPC 15 tonnes. Centre of flotation is amidships. Find the minimum amount of cargo to discharge from each hold.

Q.2. A ship 90 metres long is floating on an even keel at 6m draft in SW. The half ordinates of water plane, commencing from forward, are as follows:
0, 4.88, 6.71, 7.31, 7.01, 6.40 and 0.9 m respectively.
The half-ordinates 7.5 metres from bow and stern are 2.13 m and 3.35 m respectively. Find the area of the water-plane and the change in draft if 150 tonnes of cargo is loaded vertically over the centre of flotation. Find the position of the centre of flotation.

Q.3. A vessel displacing 14000 tonnes enters dry-dock with a clearance of 0.50m over the blocks. Drafts while entering dry-dock are 5.35 forward, 6.77m aft, MCTC 120, TPC 22 tonne, LCF 4.00 m aft of mid-ships, length 150m, KG 6.25M, KM 6.40m. Assume the hydrostatic data to remain constant.
Determine:
a) The drop in water level required before the vessel takes the blocks forward and aft.
b) The GM at the instant of taking the blocks.
c) The further drop in water before the GM reduces to zero.

Q.4. Explain with neat sketches effect on GZ values because of
a) Vertical shift b) Transverse shift of cargo on-board a ship

PART – B

Q.5 a) Explain the SOLAS regulations of piercing of Collision Bulkhead.
b) Sketch and label a transverse corrugated watertight bulkhead.

Q.6 Discuss the effect of change in density of water on the Draft and Trim.

Q.7 a) Explain process of preparing for Safety equipment survey of your ship.
b) Explain the need for vessels to undergo CAP survey.

Q.8 a) Sketch and describe Impressed current Cathodic Protection system used on ships.
b) Compare the merits and demerits of Cathodic Protection system by sacrificial anodes and ICCP system.

Q.9 With the help of sketches, write short notes on:
a) Types of welds.
b) Edge preparation of plates for welding
c) Tack welding
d) Faults in welding.

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GOVERNMENT OF INDIA

Paper 2 **Date: - 1st April-2024**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship of length 100m, half breadths of the ship's waterplane from aft are: 0.0, 3.3, 4.5, 4.8, 4.5, 3.6, 2.7 & 1.5m. Half breadth between the first two from aft is 2m. At the forward end is an appendage in way of the bulbous bow 4.4m long. Its area is $20m^2$ and its centroid 1.4m from forward, find the area of waterplane and COF.

Q.2 A vessel of displacement 29000 t, LBP 185m, KM 11.50, KG 10.95. Draft Fwd 8.00m, Aft 9.38m, LCF 89.5m, MCTC 410 tm, TPC 29.5 t/cm. The depth of water in the deck is initially 10m. Find the effective GM and drafts Fwd and Aft after the water level has fallen by 1.35m.

Q.3 M.V. Hindship, displacement 9348 T, KG 8.623 m, FSM 935Tm is to be dry-docked. When she sits overall on the blocks the residual GM (F) is to be not less than 0.15 m. Determine:
a) Maximum Trim with which vessel can enter the Dry-dock.
b) Drafts F and A with which the vessel will enter Dry-dock.

Q.4 Draw and label a ramp of Ro-Ro vessel and its effect on ship's stability.

PART – B

Q.5 Describe the stability to be satisfied by vessels carrying Grain cargo in bulk so required by International Code for Safe Carriage of Grain in Bulk.

Q.6 Write short notes on:
a) Condition Assessment Scheme (CAS).
b) Condition Assessment Program (CAP).

Q.7 a) How the flag states ensure that their rules and regulations are effectively enforced on the ships registered with them?
b) What is Enhanced Special Survey?

Q.8 a) With the help of a diagram, explain what is a corrosion cell.
b) Describe with the help of a sketch an impressed current Cathodic Protection System.

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GOVERNMENT OF INDIA

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3. **Wherever applicable, sketches should be drawn to support the answer.**

PART – A

Q.1. M.V. 'Hindship' berthed in a dock where RD of water is 1.007, at a draft of F:7.87m, A:8.32m, KG 7.45m, FSM 970 Mt. She discharged 410 t of cargo from 2 TD. A 60 T case is shifted from deck, Kg 14.7m, LCG 58.6m to No. 2 Hold. 110 T water KG 2.77m, LCG 16.23 m was received in No. 8 (P & S) tanks, filling them completely. Calculated the draft F & A at which she would sail from the dock.

Q.2. Transverse cross-sectional areas of the ship from keel to the waterline measured from AP at 12m equal interval are as follows:
600 m^2, 800 m^2, 1200 m^2, 1400 m^2, 1200 m^2, 600 m^2, 300 m^2 and 50 m^2. Forward of the forward most bulkhead is appendage whose volume is 160 m^3 and its centroid is 4m forward of the bulk head. Determine the displacement and LCB of the ship in this condition.

Q.3. A ship with lightship displacement 1700 T, KG 3.5m, is loaded with 1800 T of cargo at KG 3.8m, KM after loading is 3.8m while KN values are as follows:

	Angle of Heel					
Displacement (T)	10^O	20^O	30^O	40^O	60^O	75^O
3000	0.75	1.50	2.16	2.84	3.19	3.26
4000	0.77	1.54	2.20	2.92	3.25	3.26

Plot the GZ curve and show if the ship confirms to IMO stability criteria?

Q.4. a) Sketch and label Bow door (side opening) of a RORO Ferry.
b) Describe SOLAS regulations for minimum number of watertight bulkheads to be placed in ship.

PART – B

Q.5 Discuss the effect of change in Beam and Freeboard on the GZ curve of the ship.

Q.6 a) Describe testing requirements of main W/T compartments on cargo ships.
b) Write short notes on:
i) Watertight ii) Weather tight iii) Oil tight

Q.7 Describe the faults that can be found in welds and describes the methods of testing of these faults.

Q.8 Enumerate various types of surveys and draw a diagrammatic arrangement of various surveys as required by harmonic system of surveys and certification.

Q.9 a) Sketch and describe impressed Current Cathodic Protection system used on ships.
b) Compare the merits and demerits on Cathodic protection system by sacrificial modes and ICCP system.

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GOVERNMENT OF INDIA

Paper 2 **Date: - 9th Jan-2024**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship's water-plane is 80m long. The breadths commencing from forward are as following:
0, 3.05, 7.10, 9.40, 10.2, 10.36, 10.30, 10.00, 8.84, 5.75 and 0.0 m respectively. The space between the first three and the last three ordinates is half of that between the other ordinates. Calculate the area of the water-plane and the position of the center of flotation from aft.

Q.2 A ship of 22000 t displacement is 160m long. MCTC 280, water plane area 3060m^2, center of buoyancy 1m aft of midships and center of flotation 4 m aft of midships. It floats in water of 1.007 t/m^3 at draughts of 8.15m forward and 8.75m aft. Calculate the new draughts if the vessel moves into sea water of 1.026 t/m^3.

Q.3 M.V. Hindship sailed from port in condition No. 8 soon after departure the grounded on an isolated rock, without damage to her hull. The drafts then were observed to be F 5.90m, A 9.30m. Calculate the following: -
i) The upthrust provided by the rock.
ii) The position with respect to AP, where the grounding occurred.

Q.4 Draw and label all parts of a transverse plane watertight bulkhead showing its attachment to sides and tank top.

PART – B

Q.5 What are Cross Curves of Stability. How are they used in stability. Calculations by a Chief mate of a vessel.

Q.6 Describe the systems for indication and monitoring of bow door operation on board Ro-Ro ships.

Q.7 i) What is an Enhanced Survey Program (ESP)?
ii) List the surveys carried under the HSSC and explain the scope of the Annual Survey?

Q.8 List the causes and remedies for the following type of weld defects: -
i) Lack of fusion ii) Incomplete penetration iii) Undercutting
What is the purpose of flux in welding?

Q.9 i) What is the objective of surface preparation prior to painting? List the methods of surface preparation?
ii) With the help of a neat diagram, explain the ICCP method of corrosion prevention on board ships.

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GOVERNMENT OF INDIA

Paper 1 **Date: - 9th Jan-2024**

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1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q.1. A ship of length 200m, Beam 32m, draft Fwd: 6.05m, Aft 6.75m is to be dry docked. CF = 3m aft of midship, MCTC 400 tm, KM = 8.45m, KG = 7.8m, TPC = 29t. Calculate her residual GM and drafts Fwd and Aft when the trim has reduced to 10 cms.

Q.2. The water plane areas of a ship for drafts mentioned are as follows: 6m: 6825, 5m: 6410, 4m: 6300, 3m: 6225, 2m: 6000, 1m: 5844, 0.5m: 5705, 0: 5560. Find W and KB at 5m draft.

Q.3. M.V. 'Hindship' in D.W. of density 1.010 is at drafts F 7.60m and A 7.92m. She has to load 420 T of cargo. Calculate the position w.r.t. AP where to load the cargo so that she would be trimmed 0.80m by stern in D.W. Also, state her drafts Fwd and Aft in S.W. in final condition.

Q.4. Explain why the values of trim and metacentric height in the freely afloat conditions are important when considering the suitability of a vessel for dry-docking.

PART – B

Q.5 How do the following parameters affect the GZ curve:-
a) Beam b) Freeboard

Q.6 a) Compare the advantages and disadvantages of plain and corrugated bulkheads.
b) List the SOLAS requirements for power operated watertight doors on passenger ships.

Q.7 a) List the advantages of the Harmonised System of Survey and Certification.
b) Compare between Condition Assessment Program and Condition Assessment scheme.

Q.8 List your preparations for Safety Equipment Renewal Survey?

Q.9 Describe a typical paint scheme for:
a) Main deck including fittings b) Superstructure
c) DB tanks internal d) Forepeak tank

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GOVERNMENT OF INDIA

Paper 2 **Date: - 3rd Oct-2023**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship in upright conditions, having displacement 15000t and KG 7.0m, FSM 400 tm, following GZ value were obtained:

Heel (deg.)	0	15	30	45	60
GZ (m)	0	.38	1.0	1.41	1.2

Vessel now takes 200t of ballast in top side tank, kg 9.0m and 5.0m to port of centerline. FSM in final condition is 900 tm. If the KN values remain unchanged after ballasting. Calculate the resultant list with the help of statical stability curve.

Q.2 A ship of L = 140m, W = 16000t, LCF = 72m, MCTC =190 tm, FSM =137 tm, KM = 8.2m, KG = 7.2m, TPC = 24t, draft Fwd = 6.70m, Aft = 8.85m grounds lightly on an isolated rock. The drafts now are found to be fwd 5.90m and aft 9.30m. Calculate the virtual GM and the rise of tide required to refloat the vessel.

Q.3 M.V. Hindship floating in RD 1.020 at even keel draft of 7.0 m. She has to discharge 1000 t of cargo. Calculate the position with respect to aft perpendicular, from where the weight should be discharged so that she would be trimmed 1.0 m by the stern on completion. Also, calculate the final drafts forward and aft.

Q.4 a) Draw the horizontal sliding power operated watertight door fitted on a ship.
b) Enumerate the SOLAS requirements for these doors on ships.

PART – B

Q.5 Draw and discuss the effect on stability of ship due to increased beam and freeboard.

Q.6 a) Why does a vessel have small stern trim at the time of Dry docking.
b) How will you dry dock a loaded ship.

Q.7 Discuss the main features of ESP while explaining the requirements for inspection and surveys carried out on double hull oil tankers.

Q.8 Describe four types of welding defects and preventive measures.

Q.9 a) Describe the components of marine paint and their importance.
b) How will you calculate the wetted surface area for painting.

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GOVERNMENT OF INDIA

Paper 1 **Date: - 3rd Oct-2023**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q.1. The transverse cross section areas in m^2 within a ship of length 120m, in water of RD 1.020 from fwd are:
100 200 230 275 250 230.
Between the first 2 ordinates from fwd, there are 2 more cross section areas of 125 and 175 m^2 so that all 4 of them are spaced equally. Forward of 1st ordinate there is an appendage of vol. 600m^3. Its length 10m and centroid 5m from its fwd end. Calculate the displacement of the vessel and her LCB.

Q.2. A box-shaped vessel 150m long, 24m broad and 9m deep, has a mean draft in salt water of 6m and its trimmed 1m by the stern, KG 8.4m. State whether it is safe to drydock this vessel in this condition or not, and give reasons for your answer.

Q.3. M.V. 'Hindship' completed loading with draft fwd 6m and aft 7m in water of density 1.005. She is bound for a port in DW of density 1.020. Assuming negligible consumption of bunkers and fresh water determine her drafts in port of density 1.020.

Q.4. Sketch and label a collision bulkhead. State requirements regarding positioning and piercing allowed of collision bulkhead as per SOLAS.

PART – B

Q.5 Explain with suitable sketches the change in trim of the vessel when she goes from water of lesser density to water of higher density provided a) LCF > LCB b) LCF < LCB.

Q.6 What is an enhance survey (ESP) program? With reference to ESP describe i) substantial corrosion ii) close-up inspection iii) critical areas

Q.7 a) List out the various items to be opened and examined in dry dock as part of classification society surveys.
b) How would you prepare your vessel for load line survey.

Q.8 a) Explain manual metal arc welding, with precautions to take.
b) Describe with sketches various types of defects that could be found in welded joints and what are the remedies.

Q.9 a) Describe different types of corrosion taking place on board ships.
b) Compare sacrificial anode protection to Impressed Current cathodic protection ICCP.

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GOVERNMENT OF INDIA

Paper 2 **Date: - 14th July-2023**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship has a displacement of 9100 T, LBP of 120 m and even-keel draft of 7 m in FW of density of 1.000 t/m^3. From her hydrostatic tables it was found that:
MCTC$_{SW}$ is 130 t m/cm. TPC$_{SW}$ is 17.3 T, LCB is 2m forward of amidships and LCF is 1.0m aft of amidships.
Calculate the new end drafts when this vessel moves into water having a density of 1.02 t/m^3.

Q.2 The half breadth of a transverse watertight bulkhead 14.2m high, at 2.2m intervals from the top, are 10.6, 10, 9.3, 8.3, 7.1, 5.7 & 3.8m. Below the lowest semi-ordinates is a rectangular appendage 7.6m broad and 1m high. Find the centroid of the bulkhead above the bottom.

Q.3 A ship with lightship displacement 1,700 tonnes, KG 3.5m is loaded with 1,800 tonnes of cargo at Kg 3.8m. KM after loading is 3.8m while KN values are as follows:

	Angle of Heel					
Displacement (tonnes)	10^O	20^O	30^O	40^O	60^O	75^O
3,000	0.75	1.50	2.16	2.84	3.19	3.26
4,000	0.77	1.54	2.20	2.92	3.25	3.26

Plot the GZ curve and show if the ship conforms to IMO stability criteria?

Q.4 Explain why the values of trim and metacentric height in the freely afloat condition are important when considering the suitability of a vessel for dry-docking.

PART – B

Q.5 Sketch and label a Power operated Horizontal Sliding watertight door. Describe their testing procedures as per SOLAS.

Q.6 Discuss the effect of change in Beam and Freeboard on the GZ curve of the ship.

Q.7 a) How the flag states ensure that their rules and regulations are effectively enforced on the ships registered with them?
b) What is Enhanced Special Survey?

Q.8 Describe the faults that can be found in welds and describe the methods of testing of these faults.

Q.9 a) Explain corrosion cell with regards to galvanic corrosion.
b) Sketch and describe a Impressed current cathodic protection system (ICCP).

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GOVERNMENT OF INDIA

Paper 1 **Date: - 14th July-2023**

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 The waterplace area of the ship commencing from the load waterline to keel spaced 1m apart are as follows:-

Area	800	760	700	600	450	$10m^2$

Midway between the lowest two waterplace the area is $180m^2$.
Find the displacement and KB in SW.

Q.2 A ship of displacement 27000T, LBP = 170m, LCF=82m, LCB=90m. TPC = 29.8, MCTC = 162 is floating in SW at drafts F 8.720 m & A 9.0 m. Determine the F & A drafts of the ship when she moves to D.W. of R.D. $1.004T/M^3$.

Q.3 M.V. 'Hindship' displacement 16160 T, KG 7.850 m, FSM 2420 Tm to be dry docked. If on taking blocks overall the Residual GM (F) is to be 0.20m, determine maximum trim with which she will enter dry dock. Also state arrival drafts F & A.

Q.4 a) State the SOLAS requirements for collision bulkhead.
b) With sketch of a corrugated bulkhead, show its connection with the shell Plating and deck.

PART – B

Q.5 Describe the effect of the following on GZ curve of a vessel.
a) Increase of beam b) Increase of freeboard c) Vertical upward shift of vessels centre of gravity.

Q.6 a) Sketch and describe hydraulic closing Watertight door.
b) List and explain SOLAS requirements of watertight doors of cargo ships.

Q.7 a) What is the main advantages of harmonized system of ship's surveys (HSSS).
b) Describe the procedure for preparing the vessel for (SAFCON) safety construction renewal survey.

Q.8 a) Write brief note on butt, lap and fillet weld with help of suitable diagrams.
b) Write note on: i) Tungsten inert gas welding ii) Thermit welding

Q.9 a) What is corrosion? How many types of corrosion are there? Explain bi metallic (Galvanic corrosion).
b) Explain ICCP with help of a neat sketch.

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GOVERNMENT OF INDIA

Date: - 3rd April-2023

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 M.V. Hindship Displacement 12927 T, K.G. 7.850 m, FSM 1290 TM, is trimmed 0.70m by the stern. She has to be dry-docked. Calculate:
i) Virtual GM of the vessel when her keel takes the blocks all along the length of the vessel.
ii) Drafts F and A when she sits overall on the blocks.

Q.2 A vessel of L 148 m, LCF 70 m, draft forward 8.00 m, draft aft 9.80m, TPC 32, MCTC = 264 lightly grounds on gently sloping seabed. Soundings taken at that instant showed forward depth as 8.00 m and aft depth as 10.9 m. Find the draft after tide falls by a) 30 cm b) 2.00 m.

Q.3 M.V. 'Hindship' berthed in a dock where RD of water is 1.007, at a draft of F: 7.87 m, A 8.32 m, KG 7.45 m, FSM 970 mt. She discharged 410 t of cargo from 2 TD, A 60 t case is shifted from deck. Kg 14.7 m, LCg 58.6 m to No. 2 Hold. 110 t water kg 2.77 m, LCg 16.23 m was received in No. 8 (P & S) tanks, filling them completely. Calculate the draft F & A at which she would sail from the dock.

Q.4 a) Sketch and label Bow door (side opening) of a RORO Ferry.
b) Describe SOLAS regulations for minimum number of watertight bulkheads to be placed in a ship.

PART – B

Q.5 With reference to the International Code for the Carriage of Grain in bulk explain:
a) Intact stability criteria as applicable to ships carrying grain in bulk
b) Volumetric heeling moments and its effect on stability.

Q.6 a) Describe testing requirements of main W/T compartments on cargo ships.
b) Write short notes on: i) Water tight ii) Weather tight iii) Oil tight

Q.7 a) Explain what is 'Close up inspection' and 'Critical areas' with reference to Enhanced Survey programs. Describe the contents of "Documents File".
b) Write short notes on Condition Assessment Scheme (CAS)?

Q.8 a) List various types of welding.
b) Write short notes on weld faults?

Q.9 a) Sketch and describe Impressed Current Cathodic Protection system used on ships.
b) Compare the merits and demerits of Cathodic protection system by sacrificial anodes and ICCP system.

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GOVERNMENT OF INDIA

Date: - 3rd Jan-2023

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 M.V. Hindship sailed from port from drafts F 8.800 m and A 9.200 m resp. with KG 7.850 m and FSM 1950 TM. On her voyage she grounded on an isolated rock, without damage to her hull. The drafts then were observed to be F 8.300 m and A 9.300 m. Determine:
i) The position w.r.t. AP where the grounding occurred
ii) Virtual GM of the ship in this condition
iii) Rise in tide required to refloat the vessel.

Q.2 The water plane areas of a ship from for drafts mentioned are as follows: 5m: 6380, 4m: 6320, 3m: 6255, 2m: 6090, 1m: 5885, 1m: 5885, 0.5m: 5740, 0:5560. Find Displacement and KB at 5m draft.

Q.3 A ship has displacement 15000 MT, KG = 7.0 M,

HEEL	0	15	30	45	60
GZ	0	0.38	1.0	1.41	1.2

The vessel has loaded to this displacement but the KG is found to be 6.8m. Draw the amended GZ curve and estimate the dynamical stability at 60^{O}.

Q.4 a) What are the different functions of a watertight bulkheads?
b) How these bulkheads are attached to the sides, top and bottom of the ships structure?

PART – B

Q.5 Transverse cross sectional Area of ship of length 40 m is a triangle with Apex down. The base and depth of this triangle are 12 m and 9 m respectively. The ship is floating in Fresh water to a draft of 6 m and has KG of 5m. She loads 600 Ts of cargo kg 10 m. Determine the GM_T in final condition if the FSM of the ship was 156 TM.

Q.6 Describe the SOLAS requirements for a transverse watertight bulkhead of a cargo ship.
(a) Minimum number (b) Location (c) Initial tests

Q.7 For which type of ship is "The Enhanced system of survey" compulsory? Briefly describe the system.

Q.8 a) Using diagrams, explain the defects in wielding and how they are tested.
b) State how these defects can be minimized by good welding practices.

Q.9 Describe how corrosion is controlled on board the ship under following headings:
a) Protective Coating
b) Cathodic Protection

GOVERNMENT OF INDIA

Date: - 1st Nov-2022

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 M.V. Hindship displacing 9500t and trimmed 0.80m by stern is to be dry-docked for bottom inspection, KG = 7.92m, FSM = 1600 tm. Calculate:
a) The GM (F) of the vessel before entering the dry-dock
b) The virtual GM of the vessel when her heel taken blocks all along the length of the vessel.

Q.2 M.V. Hindship in D.W. pf density 1.010 is at drafts F 7.600m and A 7.920m. She has to load 420T of cargo. Calculate the position w.r.t. AP where to load the cargo so that she would be trimmed 0.80m by stern in D.W. Also, state her drafts F and Aft in S.W. in final condition.

Q.3 Transverse cross sectional areas of the ship from keel to the waterline measured from AP at 12m equal intervals are as follows:
600m^2, 800m^2, 1200m^2, 1400m^2, 1400m^2, 1200m^2, 600m^2, 300m^2 and 50m^2. Forward of the forward most bulkhead is appendage whose volume is 160m^3 and its centroid is 4m forward of the bulkhead.

Q.4 a) Sketch a power operated watertight door.
b) Enlist the routing inspection requirements to ensure the trouble free operation of these doors.

PART – B

Q.5 With suitable sketches, explain how will trim of vessel changes when she goes from
a) Fresh water to salt water
b) Salt water to fresh water (Given her LCB> LCF in both cases).

Q.6 Describe Condition Assessment Scheme (CAS) and explain its objectives and procedures.

Q.7 Enumerate various types of surveys and draw a diagrammatic arrangement of various surveys as required by harmonized system of surveys and certification.

Q.8 Describe the process of gas wielding, with the help of neat diagrams.

Q.9 Describe the principle of cathodic protection system against corrosion. Explain various methods used on board merchant vessels.

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GOVERNMENT OF INDIA

Date: - 14th Sept-2022

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 The length of a ship's water-plane at 6m draft is 100 metres. The half-breadths of the water-plane at equi-spaced intervals commencing from forward are: 0, 3.6, 6.0, 7.3, 7.7, 7.6, 4.8, 2.8 & 0.6 metres respectively. The vessel is floating at 6m even keel draft. It loads 200 tonnes of cargo at a location 20 m from aft end. Find the drafts forward & aft after loading assuming that water-plane remains unchanged for the range of change in drafts. MCTC = 110.

Q.2 A vessel of L = 150 m arrives dry-dock drawing 5.0 m forwards and 7.0 m aft. Her W = 12019 t, KG = 7.0 m, FSM = 800 tm, TPC = 22.47, MCTC = 174, LCB = 72.962 m, LCF = 72.476 m, KM = 8.438 m. If the declivity of the dock 20 cm per 100m, find the following when water level drops to 5.5 m above the blocks at the after end.
a) GM
b) Drafts forward & Aft

Q.3 M. V. Hindship arrives SW anchorage drawing 8.0 m even keel. She then proceeds to berth in water of RD 1.005. Assuming that there is no change in vessel's displacement in shifting from anchorage to berth, calculate her drafts forward and aft on berthing.

Q.4 Draw and label the ramp of a Ro-Ro ship.

PART – B

Q.5 Describe the stability criteria to be satisfied by vessels carrying Grain Cargo in Bulk as required by the International Code for Carriage of Gran in Bulk.

Q.6 Discuss as to how Condition Assessment Programme differs from Condition Assessment Scheme.

Q.7 State the objectives and features of ESP with reference to:
a) Age of the vessel b) Access to the Surveyor c) Coating Condition
d) Owner's Responsibility.

Q.8 In context of welding, explain:
a) Purpose of flux b) Full penetration fillet weld c) Measures adopted in minimum distortion.

Q.9 a) Explain the structure of paint and purpose of each of its constituent.
b) What is the importance of Material data Safety Sheets?

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GOVERNMENT OF INDIA

Date: - 3rd Aug-2022

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 M.V. Hindship was in condition No. 5 due to shifting of certain weights upwards her KG has increased by 0.28 m. Draw her curve of tatical stability and from the curve find the following:
a) Her GM_T.
b) Her maximum righting lever and the angle of heel at which it occurs.
c) Her range of positive stability.

Q.2 M.V. Hindship in Condition No. 3 sustained damage Aft. To carry out inspection the Aft draft has to be reduced to 4.50 m. Determine where will you load the cargo of 420 T w.r.t. AP to achieve this. Also determine the final Forward draft.

Q.3 Water plane Areas of a ship measured at 1 m equal intervals from 1 m draft till 5 m draft were as follows: 1900 m^2, 2400 m^2, 2800 m^2, 3100 m^2 and 3400 m^2 respectively.
If from keel to 1 m draft is a Triangular appendage of volume 700 m^3, determine
i) Displacement of ship at 5 m draft in S.W.
ii) KB of ship at 5 m draft.

Q.4 a) State the SOLAS requirements regarding:
i) number of bulkheads on a vessel and
ii) location of the collision bulkhead.
b) Sketch and label a stern ramp of a Ro-Ro vessel.

PART – B

Q.5 Discuss the effect of change in the Density of water in which a ship is floating on:
i) Trim ii) GZ values iii) LCG

Q.6 a) What are the regulations for the positioning of the collision bulkhead?
b) What are the special strengthening arrangements provided for the collision bulkhead compared to bulkheads fitted elsewhere?

Q.7 a) Describe various surveys and their frequency with respect to "Harmonised system of survey" for a general cargo ship.
b) Describe the procedure for preparing the vessel for safety construction (SAFCON) renewal survey.

Q.8 Write short notes on:
a) Thermit welding b) MIG Welding c) Importance of flux in welding

Q.9 What is galvanic cell in terms of corrosion? Describe SACP or ICCP methods of corrosion prevention.

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GOVERNMENT OF INDIA

Date: - 12th July-2022

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship in upright condition, having displacement 15000t and KG 7.0m, FSM 400 tm, following GZ values were obtained:

Heel (deg.)	0	15	30	45	60
GZ (m.)	0	38	1.0	1.41	1.2

Vessel now takes 200t of ballast in top side tank, kg 9.0 m and 5.0 m to port of centerline. FSM in final condition is 900 tm. If the KN values remain unchanged after ballasting, calculate the resultant list with the help of statical stability curve.

Q.2 A ship of L = 150m drawing 5.0m forward and 7.0m aft. Her W = 13,000 t, TPC = 23, LCF = 73.50 m runs aground at a point 20m aft of forward perpendicular. After grounding the drafts are found to be 4.6m forward and 7.0 aft. Find:
(a) Rise in tide required for the vessel to refloat.
(b) Upthrust experienced by the hull due to grounding.

Q.3 M.V. Hindship arrives in condition no. 7. Shore crane is used to discharge the deck cargo of locomotives that was loaded 4.0m off the centerline to port side. By use of curve of statical stability, calculate the list caused when the deck cargo of locomotives is lifted to the shore crane.

Q.4 Draw and label a plain water tight bulk head showing end – on view.

PART – B

Q.5 a) With the help of suitable diagram, explain how can initial GM be obtained from Curve of Statical Stability.
b) How would the trim of a vessel whose LCB = 73m & LCF = 74m change when she goes from FW to SW.

Q.6 Discuss as to how the Condition Assessment Programme differs from Condition Assessment Scheme.

Q.7 Describe the following in context of welding:
a) Butt Weld b) Under Cut c) Flux d) Back-run

Q.8 Good understanding of the Galvanic series of metals is vital for protection against corrosion. Discuss its application in context of shipboard measures employed in preventing corrosion of ship's hull.

Q.9 a) Describe the rule applicable regarding location of collision bulkhead.
b) Why and how is collision bulkhead specially strengthened.

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GOVERNMENT OF INDIA

Date: - 1st June-2022

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A port side wing tank forward bulkhead 15 meters wide at tank top flat deck is bounded by the ship side outboard and a longitudinal bulkhead inboard. This transverse bulkhead has the following vertical ordinates from tank top commencing from the inboard to the ship-side (both inclusive): 21.0, 20.8, 20.5, 20.1, 19.6, 19.0 and 18.0 meters. Calculate the Geometric centre of the bulkhead:
a) from the tank top and
b) from the inboard bulkhead.

Q.2 A ship of L = 200 m, W = 50000 T, MCTC = 250 T-m, KM 10 m, KG 5 m, TPC = 50 T, LCF 105 m, draft F 10,. A 11 m, grounds lightly on an isolated rock in falling tide. At low water, the drafts are found to be F 9.5 m, A 11m, Calculate the following:
a) Position of grounding from the forward perpendicular.
b) Rise in tide required to refloat the vessel.
c) Position of grounding from the centerline, if ship listed 5^{O} to port at low water.

Q.3 M.V. Hindship at a displacement 7000t in SW, KG 8.2 m, FSM = 1200 tm. Find the maximum trim with which she may enter a dry-dock, if the GM at the critical instant is not to be less than 0.5m.

Q.4 Sketch and label the mid-ship section of a bulk carrier.

PART – B

Q.5 How do the following parameters change with change in vessels draft:-
a) MCTC b) TPC c) LCB d) KM

Q.6 a) State the intact stability requirements for cargo vessels.
b) Explain the rules regarding number of openings in passenger ships and W/T door.

Q.7 Explain how you would prepare a ship for a Safety Construction Survey.

Q.8 Describe the welding faults and how they can be detected.

Q.9 Describe the various methods of corrosion prevention.

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GOVERNMENT OF INDIA

Date: - 4th May-2022

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A vessel laden with grain in bulk of SF 1.2m^3/t has a W, 88000t, her KG, calculated assuming the CG's of the cargoes in the filled compartment to be at the volumetric centroid of those compartments = 10.30 mt. FSM = 2650 mt, KM = 13.0, the VHM of the filled holds is 5800 m^4 and that of partly filled holds is 14500 m^4, the angle of flooding is 38^O. The KN values for that W are as follows:

Heel	12^O	15^O	30^O	40^O	45^O
KN	2.75	3.45	6.86	8.59	9.30

Ascertain whether she satisfies the stability criteria for vessel's laden with grain in bulk.

Q.2 A vessel of L = 140 mt, W = 16000t, MCTC = 190, TPC = 24t, LCF = 72m, KM = 8.20m, KG = 7.20m, FSM = 1370mt, draft = Fwd = 6.68m, Aft = 8.84m grounds on an isolated rock, the draft then are fwd 5.88 and aft 9.28m. Calculate following:

i) The up thrust provided by the rock.

ii) The position with respect to after perpendicular, where the grounding occurred.

iii) The virtual GM (f) of the vessel then.

Q.3 M.V. Hindship at a displacement of 13750 t, KG 7.32m, FS Moment 1146 mt, is listed 2½^O to stbd and has yet to load 380 tonnes of cargo. Space is available in No. 3 TD, 1.5 metre to stbd of centre line and in No. 5 UTD, 6.2 metres to port of CL. Find the amount of cargo to be loaded in each space, so that the ship will be upright on condition.

Q.4 Sketch and describe the arrangement of ramp doors of Ro-Ro ships and its effect on ships stability.

PART – B

Q.5 Sketch and describe a collision bulkhead. State its principal function and location in the ship.

Q.6 Describe the effect of the following on GZ curve of a vessel:

a) Beam increase b) Freeboard increase c) Vertical upward shift of vessel centre of gravity

Q.7 a) What is enhanced of survey? To which ships does this system apply?

b) What documentation is done on board with respect to enhanced system of survey?

Q.8 a) Describe submerged arc welding?

b) Describe the various welding faults.

Q.9 a) Describe the methodology of selecting a suitable protective coating for different areas of ship in order to minimize the effects of marine corrosion.

b) Describe the painting scheme for weather decks.

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GOVERNMENT OF INDIA

Date: - 9th March-2022

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship is floating upright in S.W. on an even keel at 7m draft F and A. The TPC's are as follows:

TPC's are as follows:

Draft (M)	1	2	3	4	5	6	7
TPC (tonnes)	60	60.3	60.5	60.5	60.5	60.5	60.5

The volume between the outer bottom and 1m draft is 3044m^2, and its centre of gravity is 0.5m above the keel. Find the ship's KB.

Q.2 A ship of L = 130 m, W = 5200 t, CF = 2m aft of midship MCTC = 140mt, KM = 6.5, K.G. = 6.0m, TPC = 20t, draft Fwd = 4.35m, Aft = 5.41m dry docked. Calculate her residual GM and the drafts F and A.

i) When the trim reduced to 35 cms.

ii) When the water level has been lowered 1.2m after she has taken the blocks all over.

Q.3 'M.V.Hindship' arrives in FW river port at a draft of F 7.5m and A 7.8m. She has to load 450t of cargo. Calculate the position with respect to AP, where this weight should be loaded so that she would be trimmed 1.0m by the stern on reaching open sea in SW. Also, mention her final drafts in SW.

Q.4 Sketch and label the transverse corrugated watertight bulkhead on a cargo ship showing its connection to the adjoining parts.

PART – B

Q.5 Draw and explain the Curve of Statical Stability for a listed ship and the ship at angle of loll.

Q.6 a) Draw the power operated watertight door fitted on a ship.

b) Enumerate the SOLAS requirements for a power operated watertight door on ships.

Q.7 a) Explain the Enhanced Survey Programme for ships?

b) Describe: i) Substantial corrosion ii) Close up inspection and iii) Frequency of bottom survey / inspection as per Enhanced Survey Programme.

Q.8 Explain the destructive methods used for testing weld joints.

Q.9 a) How improved design of a ship and its various structures can help reducing corrosion? Describe with suitable examples.

b) How does the cathodic protection help shipboard corrosion?

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GOVERNMENT OF INDIA

Date: - 7th January-2022

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

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A vessel floating at drafts forward 8.0 m aft 9.0 m, grounds at a point 25 m aft of forward perpendicular. Calculate the drafts and virtual GM of the ship when the tide has fallen by 75 cm. Given MCTC 300 tm, TPC 30 t, KG 7.5 m, KM 8.5 m, Length 165 m, LCF 80 m, forward of AP, FSC 0.151 m, Displacement 29500 t.

Q.2 M. V. Hindship arrives for part loading in DW of RD 1.010 at drafts F 8.8 m and A 9.2 m. Calculate the amount of cargo and the location with respect to AP, where it can be loaded so as to achieve even keel summer load draft in SW.

Q.3 A vessel laden with grain in bulk of SF 1.2 m^3/t has a displacement, 88000t, her K.G., calculated assuming the CG's of the cargoes in the filled compartment to be at the volumetric centroid of those compartments = 10.30 m. FSM = 2650 m, KM = 13.0 m, the VHM of the filled holds is 5800 m^4 and that of party filled holds is 14500 m^4. The KN values for that displacement are as follows:

Heel	12^O	15^O	30^O	40^O	45^O
KN	2.75m	3.45m	6.86m	8.59m	9.30m

Ascertain whether she satisfies the stability criteria for vessel's laden with grain in bulk. Given: The angle of flooding is 41^O. Angle of heel having maximum difference between righting arm and heeling arm is 46^O.

Q.4 a) Draw the horizontal sliding power operated watertight door fitted on a ship.
b) Enumerate the SOLAS requirements for a power operated watertight door on ships.

PART – B

Q.5 Explain how a vessel changes for draft when she goes from sea water to fresh water.

Q.6 Draw and explain the Curve of Statical-Stability for a listed ship and the ship at angle of loll.

Q.7 Explain how the "Enhanced Survey Programme" has been helpful in making the ships safer.

Q.8 Explain the various methods used for testing weld joints.

Q.9 a) Differentiate between corrosion and erosion. Enlist different types of corrosion on board ships.
b) How does the cathodic protection help reduce shipboard corrosion?

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GOVERNMENT OF INDIA

Date: - 10th November-2021

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 The breadths of a transverse watertight bulkhead, at 2 m intervals from the bottom are 2, 5.8, 8.4, 10.2 & 11.4 m. Find (a) its area (b) the distance of its geometric centre from the top.

Q.2 A vessel of L = 150m arrives dry-dock drawing 5.0m forward and 7.0m aft. Her W = 12019 t, KG = 7.0m, FSM = 800 tm, TPC = 22.47, MCTC = 174, LCB = 72.962m, LCF = 72.476m, KM = 8.438m. If the declivity of the deck 20cm per 100m, find the following when water level drops to 5.5m above the blocks at the after end.

a) GM

b) Drafts forward & aft

Q.3 'M.V.Hindship' displacement 8473 MT, KG: 8.84m, FSC: 0.146m, is to be Dry-docked. At the critical instant the GM (f) of the vessel is to be not less than 0.20m. Determine the maximum trim by stern with which she will enter Dry-dock if she is to take to the blocks first at the AP. Also state the arrival dry-dock drafts F and A.

Q.4 a) Sketch & label a collision bulkhead. (20 marks)

b) Describe the SOLAS regulations for placing & piercing of Collision bulkhead. (10 marks)

PART – B

Q.5 Discuss the effect of increasing a) Beam b) Freeboard on the stability of the ship.

Q.6 Discuss as to how the Condition Assessment Programme differs from Condition Assessment Scheme.

Q.7 a) Explain the importance of harmonization of surveys. (10 marks)

b) Explain the survey programme of an enhanced survey programme (ESP). (10 marks)

Q.8 Write brief notes on BUTT, LAP & FILLET welds. List & describe the main causes of faults in welding and show how they may be overcome by good welding practices.

Q.9 Describe (SACP) Sacrificial anode cathodic protection & (ICPP) Impressed current cathodic protection, methods of corrosion prevention.

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GOVERNMENT OF INDIA

Date: - 1st September-2021

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 The breadths of a transverse watertight bulkhead, at 2 m intervals from the bottom are 2, 5, 8, 8.4, 10.2 & 11.4 m. Find (a) its area (b) the distance of its geometric centre from the top.

Q.2 A ship of L = 140m, COF = 2m, FWD of M/Ship, KM = 6.1 m, KG = 5.5 m, MCTC = 130 tm, TPC = 16, W = 5700T, at Drafts F/4.15 m, A/4.85 m, grounds on a rock. 10 abaft her stem. The tide then falls by 0.80 m. Calculate her V GM then and her final Draft F & Aft?

Q.3 'M.V.Hindship' is at a draft of F 6.38 m, A 7.24 m, KG 8.06 m, FSM 1172 mt, 100 t of ballast is run into No. 3 (P) DB tank, CG 8.0 m from CL. Draw the curve of statical stability and from it and determine the angle of list.

Q.4 Sketch and label a horizontal sliding watertight door and state the SOLAS requirements for the closure of such doors.

PART – B

Q.5 Explain why the change of trim happens with change of density when:-
i) Vessel goes from SW to FW ii) FW to SW

Q.6 a) Describe with the aid of a simple sketch, securing and locking arrangements of bow doors on ships.
b) State the hazardous conditions for the ship when the watertight doors need to be closed.

Q.7 a) Under the Harmonized system of surveys & Certification explain how will you prepare you vessel for an annual Load Line survey?
b) List the certificates required to be carried on board an oil tanker in addition to statutory & mandatory certification carried by cargo ships.

Q.8 a) Describe the various defects in welding, their causes and remedies.
b) Write short notes on: i) Submerged Arc welding ii) T.I.G. welding.

Q.9 What are the various methods of controlling corrosion on board? Describe with a neat sketch, the Impressed Current Cathodic Protection method of corrosion control with its advantages and disadvantages.

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GOVERNMENT OF INDIA

Date: - 5th July-2021

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship of displacement – 20,000t, KM – 7.6m, KG – 6.2m, FSM – 1200TM, TPC – 30t is listed 3^{O} to stbd. Her present mean draft is 8.4m and she is to finish loading at 8.6m mean draft. Space is available 6m on port side and 5m on stbd side of the CL. State how much cargo to be stowed on either side to finish Upright.

Q.2 A vessel of displacement 24000, LBP = 180, LCF = 20, TPC = 20, MCTC = 200 arrives in D.D. with drafts f = 8.20m, A=9.00m. Determine the residual GM when water level falls by 40cms after the stern touches the blocks. KG = 7.90m, KM = 8.30 m, FSM initial = 2000 Tm.

Q.3 'M.V.Hindship' in dock water of RD 1.020 at drafts of 8.68 and 8.88. She has to load cargo such that in SW. She will be at summer load line and trimmed 50cms by stern. Space is available in No. 2 TD. Calculate quantity to load and final drafts F & A.

Q.4 a) State the SOLAS requirement for collision bulkhead.

b) With a sketch, show various views of corrugated bulkhead, showing its connection with the Shell plating and deck.

PART – B

Q.5 Discuss the effects of shift of cargo and the GZ values & GZ curve of a vessel.

Q.6 a) Sketch and describe hydraulically closing Watertight door.

b) List an explain SOLAS requirements of W.T. door for cargo ships.

Q.7 a) What is the condition assessment scheme as applied for oil tankers?

b) What is the basic difference between condition assessment scheme and Condition assessment programme?

c) How will you as Chief Officer, prepare the ship for special survey?

Q.8 Write brief note on butt, lap and filled weld. List and describe the main causes of faults in welding and show how these defects can be improved by good welding practice?

Q.9 What is a galvanic cell in terms of corrosion? Describe SACP or ICCP method of corrosion prevention.

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GOVERNMENT OF INDIA

Date: - 3rd March-2021

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A vessel of length 141 mtrs, CoF = 2.6 mtrs, forward of midship, MCTC = 144, TPC = 19, KM = 7.7m, KG = 6.9m, w = 11300 T, at a dft F = 3.80m, A = 5.68m is floating in a dry dock where depth of water is 6.5m above the top of the blocks. Calculate vessels residual GM and drafts F & A.

When:- a) W/L is lowered by 1.75m, and b) V/L is unstable.

Q.2 A ship of length of 160m, disp W = 10500t, CF = 3m abaft the midship, in MCTC = 160mt, TPC = 18t, KM = 7.0m, Kg = 6.6m at draft of 6.9m forward, 7.3m aft, grounds lightly on a rock 14m abaft the fore end. The tide then falls by 90cm. Calculate her virtual GM and drafts forward and aft then.

Q.3 'M.V.Hindship' at a draft of 7.66m, A 7.82m, loads 220t in No.2 TD and consumes 30t of FW from the TD drinking water tank (P). Calculate the final drafts F & A.

Q.4 Sketch and label a stern ramp of a Ro-Ro vessel.

PART – B

Q.5 What are KN curves? How do KN Curves assist a Chief Mate of a vessel in determining the Intact Stability of a Ship?

Q.6 a) With the help of a suitable diagram, state the working of a power operated sliding watertight door.

b) State the SOLAS requirements regarding: i) number of bulkheads on a vessel and ii) Location of the collision bulkhead.

Q.7 a) State the main features of the HSSC? State the circumstances when you will call the surveyor for additional survey?

b) When does a certificate become invalid? How is the validity of such a certificate restored after it ceases to be valid?

Q.8 Explain with sketches the various types of weld joints.

Q.9 Write notes on:

i) Power tool cleaning

ii) Sacrificial anode system of corrosion control

iii) Corrosion cell

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GOVERNMENT OF INDIA

Date: - 9th December-2020

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship's water plane is 180m in length. The half ordinates of the water plane. Commencing from forward are as follows: 0.4, 4.4, 8.8, 11.0, 11.6, 11.8, 11.6, 9.6, 7.0, 0.4 meters respectively. The spacing between the 4 middle ordinates is twice that of the others. Calculate her water plane area, TPC and the position of the CF with respect to the mid length.

Q.2 A Box shaped vessel 125m long, 20m broad at 3m draft even keel in SW, KG 3.0m. Cargo of 1500 ts is loaded with LCG of 61m and kg 4.8m. Find the draft forward and aft after loading.

Q.3 M. V. 'Hindship' arrives at port with SW drafts 7.25m forward and 8.30 m aft, KG 7.5 m, FSM 1600 Tm. The DB Tanks 2P, 2S, 4P and 4S were full of SW ballast at arrival. She then loads 400T in No.2 Tween Deck-2m to the Port of centerline, discharges 300T from No. 5 hold 5m to the port of centerline. 2Ws DB were pumped out and 4Ws DB were reduced to minimum to correct list. Calculate her final GM (fluid) and drafts, if the CG of the 4P and 4S DB tanks is 7m from centerline to the respective sides.

Q.4 Sketch and label a diagram of watertight corrugated transverse bulkhead and discuss its construction and functional aspects. State the advantages of corrugation.

PART – B

Q.5 M. V. Hindship is at even keel draft of 9.30m floating in fresh water. Calculate her drafts forward and aft when she goes to SW, assuming negligible consumption of fuel and fresh water. Explain the change of trim with a diagram.

Q.6 State the rules and regulations governing the requirement of minimum number of bulkhead on ships, describe with the help of sketches the strengthening arrangement of the collision bulkhead.

Q.7 Briefly describe the scope of initial, annual, intermediate and renewal surveys for loadline certificate.

Q.8 a) Explain defects in welds using sketches.
b) Write about the tests to locate the defects in welding.
c) Briefly describe good welding practices to minimize these defects.

Q.9 Describe a typical paint scheme for:
a) Underwater areas and flat bottom b) boot-top area
c) top side area d) ballast tank interior

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GOVERNMENT OF INDIA

Date: - 12th October-2020

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 The fore deck of a vessel is 60m in length. The width off the deck at equal intervals commencing from its fore end are 12.0, 13.5 and 15.8m. Calculate the area and the CG of the area from the fore end with respect to: a) Fwd half of the deck b) After half of the deck.

Q.2 A vessel of length 84m, displacement 3000t, TPC = 12t, KM = 4.5M, K.G. = 4.05m, MCTC = 80 mtm, CF 2m abaft of mid-ship at a draft of F 4m, A 4.5m is dry-docked. Calculate:

i) The residual GM on taking blocks all over.

ii) Her drafts F & A.

Q.3 M. V. 'Hindship' is floating in SW at an even keel draft of 9.158m. Find how much ballast should be run in FPK or APK to maintain her even keel condition when she goes from SW to FW.

Q.4 a) Sketch and label horizontal sliding watertight door?

b) Discuss its salient constructional and operational features?

PART – B

Q.5 Draw a sketch of statical stability curve for a vessel which is at an angle of loll. Also suggest the remedial action to be taken explaining the reasons for same.

Q.6 a) What are the various types of defects which are likely to occur in welding work? Sketch and explain each?

b) How is distortion avoided during welding of a structure?

Q.7 a) How the flag states ensure that their rules and regulations are effectively enforced on the ships registered with them?

b) What is Enhanced Special Survey?

Q.8 a) Describe and compare the TIG and MIG welding processes.

b) What are the advantages and disadvantages of manual and automatic welding processes used in ship construction?

Q.9 a) What are the different types of corrosion experienced by the ships structure?

b) Compare different types of corrosion prevention adopted for ships and their merits and demerits.

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GOVERNMENT OF INDIA

Date: - 7 Jan-2020

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship of length 77m is floating in water of RD 1.015. The areas of the transverse cross section of the underwater part of the ship measured at equidistant interval from forward are as follows: 450, 510, 610, 730, 800, 820, 750, 600 m^2. Calculate the displacement & L.C.B. of the ship.

Q.2 A vessel of following particulars enters a SW dry dock. LBP = 140m, D_F= 3.4m, D_A = 5.8m, KG = 8.0, KM = 9.02, displacement = 8930t, TPC = 21.9t, LCF = 72.2m from AP, MCTC 162.5 tm. Find the virtual GM and draft F & A, when the level water has fallen one meter after stern has taken to the blocks. Given KM at this displacement 9.18m.

Q.3 M. V. 'Hindship' in Fresh Water is at a draft of F 6.32 m, A 7.18 m. Calculate the position with respect to AP, from where 140t should be discharged to reduce her ford draft by 32 cms.

Q.4 Sketch and describe the functioning of a power operated sliding type watertight door.

PART – B

Q.5 Explain how the values of following parameters change with change in vessel's draughts:

i) KM_T ii) LCB iii) MCTC iv) LCF

Q.6 a) State the intact stability requirement for carriage of grain.

b) What is cofferdam? Where it is fitted and what are its functions?

Q.7 a) Describe the frequency of class surveys? How would you prepare your ship for Load line survey?

b) Write short notes on Condition Assessment Scheme and Condition Assessment Programme?

Q.8 Describe electric arc welding? What are the faults associated with it and what is the purpose of flux coating on electrodes?

Q.9 Distinguish between corrosion and erosion. Describe the various methods of preventing corrosion on board ships.

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GOVERNMENT OF INDIA

Date: - 10 Oct-2019

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 M.V. HINDSHIP in Condition No.5 grounds at a single point, port off her centre line and 60m forward of her aft perpendicular, without rupturing her bottom plating. The tide then falls by 20 cms, listing her 3^O to starboard. Calculate the following:

a) The up thrust provided at the point of grounding.

b) The virtual GM_F then.

Q.2 A vessel length of 124m displacement 7100 mt, CF = 3m fwd of midship, MCTC = 120, TPC = 20, KM = 6.2m, KG = 5.8m at a draft of 4.0 m fwd and 4.9 m aft grounds lightly on a rock 12m abaft her fore end. Calculate:

a) The fall of tide that will make the vessel unstable.

b) Drafts F & A then.

Q.3 M. V. Hindship in condition No.6 has 300 t of cargo to shift horizontally 7m and vertically downwards 4m. Draw the GZ curve up to 40^O after the shift has taken place and estimate the resulting list.

Q.4 a) Sketch a hinged type watertight door showing securing arrangements to ensure water tightness.

b) What are the different categories of watertight doors?

PART - B

Q.5 With the help of Righting Lever diagrams, enumerate the:

a) Intact Stability requirements for ships authorized to carry Grain in Bulk.

b) Required contents of Intact Stability Booklet, as per Intact Stability Code.

Q.6 State the SOLAS requirements for the following:

a. The minimum number of transverse watertight bulkheads on ships.

b. The location of the collision bulkhead and

c. The testing of water-tight bulkheads.

Q.7 a) What are the survey requirements for an oil tanker undergoing 3^{rd} special survey?

b) What are the preparations to be carried out for the above vessel prior to the commencement of the survey?

Q.8 a) Compare the Submerged Arc Welding and Manual Metal Arc Welding processes.

b) How effective weld penetration is achieved while welding thick steel plates?

Q.9 a) Why corrosion prevention non ship's structure is very important to ensure safety of life and marine environment?

b) What are the different means of corrosion prevention adopted for the ship's structure?

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GOVERNMENT OF INDIA

Date: - 2nd July-2019

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 The deck and keel of a flat bottomed barge are identical. Its sides are vertical. The deck consists of two sections. The bow is a triangle 12m broad and measures 12m in the fore and aft direction, the mid body is rectangle 50m long and 12m wide. If it is floating on an even keel in SW with displacement 3444t, find the position of its COB with reference to the keel and with reference to its after end.

Q.2 M.V. Hindship drawing 4m fwd and 5.2m aft enters a SW dry-dock. KG 8.0m, FSM = 1000tm. Find the GM (i) on taking the blocks overall.

Q.3 A ship displacing 8500t, GM-1.0m is listed to 2.5^{O} on the port side. A weight of 60t on deck kg-11.5m and 3.5m to port of CL is to be discharged over the stbd side. Using her derrick, the head of which is 21m above the keel, with an outreach of 10m from the CL. Calculate the list.

a) When the weight is picked up by the derrick plumped over the weight.

b) When the derrick is swung out.

Q.4 With respect to the transverse watertight bulkheads fitted on ships.

a) Sketch and label one such bulkhead showing its attachments to the sides, top and bottom.

b) Functions of transverse watertight bulkheads.

c) Regulations for the testing of such bulkheads.

PART - B

Q.5 How do the following parameters affect Stability (GZ Curve):-

a) Beam b) Freeboard

Q.6 a) Explain the intact stability requirements for carriage of grain.

b) Explain what is Angle of Loll and its corrective actions.

Q.7 Explain how you would prepare a ship for Load Line Survey.

Q.8 Describe the destructive and non-destructive methods of testing welds.

Q.9 Describe SACP and ICCP methods of corrosion prevention.

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GOVERNMENT OF INDIA

Date: - 1st April-2019

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A ship is floating upright in S.W. on an even keel at 7 m draft F & A.
The TPCs are as follows:

Draft (m)	1	2	3	4	5	6	7
TPC (Tonnes)	60	60.3	60.5	60.5	60.5	60.5	60.5

The volume between the outer bottom and 1m draft is 3044 cu.m and its centre of gravity is 0.5m above the keel. Find the Ship's KB.

Q.2 A vessel floating at drafts: forward 8.7m, Aft 9.4m, grounds at a point 30m aft of forward perpendicular. Find the drafts of the vessel and the GM after tide has fallen by 70 cm, if MCTC is 340tm, TPC 28, KG 7.6m, KM 8.4 M, length 162m, LCF 78m forward of AP, Displacement 29000t.

Q.3 M.V. Hindship arrives port in water of RD 1.027 drawing F 7.00M/A 8.00M. Find her drafts F & A upon berthing in FW.

Q.4 a) Sketch and label forward collision bulkhead?
b) Explain its constructional and location details? How does it differ from aft collision bulkhead?

PART - B

Q.5 Explain the effect of change in drafts of a ship shape vessel on:
a) KM_T b) LCB c) MCTC d) LCF

Q.6 a) What are the regulations for the positioning of the collision bulkheads?
b) What are the special strengthening arrangements provided for the collision bulkhead compared to bulkheads fitted elsewhere?

Q.7 Write short notes on the following:
a) Harmonized System of Survey and Certification.
b) Condition Assessment Scheme.

Q.8 a) Describe three types of automatic welding process used in shipyards.
b) Describe three types of welding defects and preventive measures.

Q.9 a) Sketch and describe Impressed Current Cathodic Protection system used on ships.
b) Compare the merits and demerits of Cathodic protection system by sacrificial anodes and ICCP system.

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GOVERNMENT OF INDIA

Date: - 3rd Jan-2019

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

Part – A

Q.1 M.V. HINDSHIP is at a displacement of 15000 tonnes, KG 7.32 m, FSM 786 tm, is listed 3.5^O to starboard and has yet to load 380 tonnes of cargo. Space is available in No. 2 T Dk (2m starboard off centre line) and in No. 5 upper tween deck (5m to port off centre line). Find the amount of cargo to be loaded in each space so that the ship will have list of 1^O to starboard list with a final GM (solid) of +1.10m.

Q.2 The water plane areas of a ship at one meter draft intervals, commencing from the keel upwards are as follows:

Draft (m)	0	1	2	3	4	5	6
Areas (m^2)	5850	5885	5900	5915	5943	5975	5995

Calculate her KB and FWA at a draft of 6 meters.

Q.3 A vessel of length 130 m, displacement 12420 tonnes. COF 3 m aft of mid length KG 5.25m, KM 5.90m, TPC 18, MCTC 140 tm, is at a draught of F/5.34m, A/6.62m, grounds on a rock 8 m aft of stern.
Calculate her residual GM and draughts Fore & aft if the tide falls by 80 cms after grounding. (Assume above is a case of centre line grounding with no damage to the hull).

Q.4 Sketch, label and describe a corrugated watertight bulkhead. Explain the function of bulkheads, and their number and location requirements.

PART - B

Q.5 a) What are the reasons for desirability of dry docking with the small stern trim.
b) What precautions will you take for dry docking a loaded ship.

Q.6 a) What are the relative advantages and disadvantages of corrugated bulkheads over plate type bulkheads?
b) What are the special strengthening arrangements provided for the bulkheads bounding the tanks for the carriage of oil?

Q.7 a) What are the survey requirements for an oil tanker undergoing 3rd special survey?
b) What are the preparations to be carried out for the above vessel prior to the commencement of the survey?

Q.8 a) Compare the Submerged Arc Welding and Manual Metal Arc Welding processes.
b) What are the functions of flux used in welding?
c) How effective weld penetration is achieved while welding thick steel plates?

Q.9 a) Why corrosion prevention on ship's structure is very important to ensure safety of life and marine environment?
b) What are the different means of corrosion prevention adopted for the ship's structure?
c) Why only a single system of corrosion prevention is not employed on ships?

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GOVERNMENT OF INDIA

Date: - 7th Oct-2018

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

Part – A

Q.1 The water plane of a ship is 72 m long. It's half ordinates starting from forward and equally spaced are given below. Calculate the TPC & the LCF of the vessel.

Ord No.	1	2	3	4	5	6	7	8	9	10
½ ord (m)	0.0	3.2	6.4	8.8	10.6	10.2	8	6.2	3.8	1.0

Q.2 M. V. Hindship displacing 9500 t and trimmed 0.80 m by stern is to be dry-docked for bottom inspection. KG = 7.92m, FSM = 1600 tm. Calculate:

a) The GM (f) of the vessel before entering the dry-dock.
b) The virtual GM of the vessel when her heel takes blocks all along the length of the vessel.
c) F & A draft at which the virtual GM of the vessel becomes 0.

Q.3 A ship has displacement 15000 MT KG=7.0

HEEL	0	15	30	45	60
GZ	0	0.38	1.0	1.41	1.2

The vessel has loaded to this displacement but the KG is found to be 6.8m. Draw the amended GZ curve and estimate the dynamical stability at 60^{O}.

Q.4 a) Sketch a power operated watertight door.
b) Enlist the routine inspection requirements to ensure the trouble free operation of these doors.

PART - B

Q.5 a) Discuss the effect on stability of ship due to increased beam and freeboard.
b) Define critical instant, critical period and Declivity of docks.

Q.6 a) Explain the intact stability requirement for carriage of grain.
b) What is a cofferdam? Where is it fitted and what are its functions?

Q.7 Write short notes on the following:
a) Harmonized System of Survey and Certification.
b) Condition Assessment Scheme.
c) Enhanced Survey Programme.

Q.8 a) Describe three types of automatic welding process used in shipyards.
b) Describe three types of welding defects and preventive measures.

Q.9 a) Describe the methodology of selection a suitable protective coating for different areas of ship in order to minimize the effects of marine corrosion.
b) Write down the components of marine paint and their importance.

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GOVERNMENT OF INDIA

Date: - 10th July-2018 (2nd Seating Noida & Chennai)

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

Part – A

Q.1 A ship is floating upright in sea water of density 1.025t/m3 on an even keel draft of 7.0m. The TPC's at 1.0 interval are as follows:

Draft (m)	1	2	3	4	5	6	7
TPC (t/cm)	60	60.3	60.5	60.4	60.4	60.2	60

The volume between the keel and 1m draft is 3022m^3 and its centroid is 0.5m above the keel. Find the ship's KB and displacement at 7.0m draft?

Q.2 A vessel floating at draft Fwd: 8.7m, Aft: 9.4, grounds at a point 30m aft of forward perpendicular. Find the drafts of the vessel and the GM after tide has fallen by 70cm, if MCTC is 340tm, TPC 28, KG 7.6m, KM 8.4m, Length 162m, LCF 78m forward of AP, displacement 29000t.

Q.3 M.V. Hindship is floating in SW with displacement 11000 tons, KG 7.5 and FSM 1000tm. A weight of 500 tons is shifted from port to starboard through a distance of 10m. Draw the full GZ curve and from it calculate the list.

Q.4 Sketch a labeled diagram of watertight bulkhead and discuss its constructional and functional aspects. State the advantages of corrugation.

PART - B

Q.5 A Fully loaded ship may roll 25^O to either side without causes for alarm. However, the ship falling over to an angle of loll of 15^O to one side is cause for great concern. Justify above statement, supporting your answer with well arguments.

Q.6 a) Describe how anti-fouling paint and anti-corrosive paint acts.
b) Explain the difference between water tight and weather tight doors.

Q.7 Enumerate the preparations you would make to prepare a bulk carrier for load line and safety construction renewal survey.

Q.8 List and describe the destructive and non-destructive methods of testing welds.

Q.9 Write short notes on the following:

a) Sacrificial anode
b) Cavitations
c) Corrosion
d) Safety precautions when using paints

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GOVERNMENT OF INDIA

Date: - 3rd July-2018

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CCARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER – I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

Part – A

Q.1 The waterplane area of the ship commencing from the load waterline to keel spaced in 1m apart are as follows:

Area 800 760 700 600 450 10 m2

Midway between the lowest two water plane the area is $180m^2$

Find the displacement and KB in SW.

Q.2 A ship of length 100m and maximum breadth 18m, has following TPC values commencing at 8m draught and downwards:

Draught (m)	8.0	7.5	7.0	6.0	5.0	4.0	3.0	2.0	1.0	0.5	0
TPC	25	24	22.5	20	18	15	12	9.0	6.5	4.2	3.0

Calculate the following, at ship's 8m draught:

a) Displacement b) KB c) C_B (Block Co-efficient).

Q.3 A vessel of length 200m floats in water of R.D. 1.002 with draught of Fwd-7.50m, Aft-8.20m. She goes to water R.D. 1.020, without change in distribution of weighs of onboard. Find her new draughts Fwd & Aft in water of R.D. 1.020. Her hydrostatic particulars in salt water are as follows: MCTC = 140 tm; TPC = 25; LCF = 95 m; LCB = 105 m, Displacement = 40000 Tonnes.

Q.4 a. Draw and label a neat diagram of a flat transverse watertight bulkhead?

b. What are the SOLAS requirements regarding piercing of the collision bulkhead to allow for dealing with liquid in the fore peak tank?

PART - B

Q.5 a) What are the reasons for desirability of dry docking with the small stern trim?

b) What precautions will you take for dry docking a loaded ship?

Q.6 a) What are the relative advantages and disadvantages of corrugated bulkheads over plate type bulkheads?

b) What are the special strengthening arrangements provided for the bulkheads bounding the tanks for the carriage of oil?

Q.7 With respect to Enhanced Survey, explain the following:

a. Critical Areas b. Suspect Areas c. Close-up inspection d. Substantial Corrosion.

Q.8 a. Describe with sketches, the various types of weld 'Joints'

b. List the various defects in welding. Explain any one of them.

Q.9 Explain the various methods of surface preparation prior to the application of paints.

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GOVERNMENT OF INDIA

Date: - 2ND April-2018

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP AND CCARE FOR PERSONS ON BOARD (Management Level)

Paper:- NAVAL ARCHITECTURE PAPER - I

TIME: 3 Hours **PASS MARKS: 120** **MAX. MARKS: 200**

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks).
3. Whenever applicable sketches should be drawn to support the answer.

Part - A

Q.1 A ships water plane is 80m long the breadths commencing from fwd are as follows: 0, 3.05, 7.1, 9.4, 10.2, 10.36, 10.3, 10.0, 8.84, 5.75 and 0m respectively. The space between the first three and last three ordinates is half of the other ordinates. Calculate the area of water plane and its position of the centre of floatation.

Q.2 A vessel of L 148 m, LCF 70 m, draft forward 8.00 m, draft aft 9.80 m, TPC 32, MCTC = 264 lightly grounds on gently sloping seabed. Soundings taken at that instant showed forward depth as 8.00 m and aft depth as 10.9m. Find the draft after tide falls by a. 30cm b.2.00m.

Q.3 M.V. 'Hindship' berthed in a dock where RD of water is 1.007, at a draft of F: 7.87m, A: 8.32m, KG 7.45m, FSM 970 mt. She discharged 410 t of cargo from 2 TD. A 60t case is shifted from deck, Kg 14.7m, LCg 58.6m to No.2 Hold. 110 t water kg 2.77m, LCg 16.23 m was received in No.8 (P & S) tanks, filling them completely. Calculate the draft F & A at which she would sail from the dock.

Q.4 (a) State the SOLAS requirements regarding: i) number of bulkheads on a vessel and
II) Location of the collision bulkhead.
(b) Sketch and label a stern ramp of a Ro-Ro vessel.

PART - B

Q.5 Discuss the effect of change in the Density of water in which a ship is floating on:
i) Trim ii) GZ values iii) LCG

Q.6 a) What are the regulations for the positioning of the collision bulkhead?
b) What are the special strengthening arrangements provided for the collision bulkhead compared to bulkheads fitted elsewhere?

Q.7 a) Explain what is Close up inspection and 'Critical areas' with reference to Enhanced Survey program. Describe the contents of "Documents File".
b) Write short notes on Condition Assessment Scheme (CAS)?

Q.8 a) List various types of welding.
b) Write short notes on weld faults?

Q.9 a) Sketch and describe Impressed Current Cathodic Protection system used on ships.
b) Compare the merits and demerits of Cathodic protection system by sacrificial anods and ICCP system.

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66B

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

TIME: 3 HOURS | PASS MARKS: 120 | MAX MARKS: 200

Notes:
1. All questions in Part A are compulsory and carry 30 marks each
2. Attempt any four out of five from Part B (Each question carries 20 marks)
3. Whenever applicable sketches should be drawn to support the answer

PART – A

Q. 1 M.V. Hindship sailed from port with drafts F 8.800m and A 9.200 m resp. with KG 7.850m and FSM 1950 TM. On her voyage she grounded on a isolated rock, without damage to her hull. The drafts then were observed to be F 8.300 m and A 9.300m. Determine

i) The position w.r.t. AP where the grounding occurred
ii) Virtual GM of the ship in this condition
iii) Rise in tide required to refloat the vessel.

Q. 2 M.V. Hindship in Condition No. 3 sustained damage Aft. To carry out inspection the Aft draft has to be reduced to 4.50 m. Determine where will you load the cargo of 420 T w.r.t. AP to achieve this. Also determine the final Forward draft.

Q. 3 Water Plane Areas of a ship measured at 1 m equal intervals from 1 m draft till 5 m draft were as follows:
1900 m^2, 2400 m^2, 2800 m^2, 3100 m^2 and 3400 m^2 respectively.
If from keel to 1 m draft is a Triangular appendage of volume 700 m^3, determine

i) Displacement of ship at 5 m draft in S.W.
ii) KB of the ship at 5 m draft.

Q.4 a) What are the different functions of watertight bulkheads?
b) How these bulkheads are attached to the sides, top and bottom of the ships structure?

PART - B

Q.5 Transverse cross sectional Area of ship of Length 40m is a triangle with Apex down. The base and depth of this triangle are 12 m and 9 m respectively. The ship is floating in Fresh water to a draft of 6 m and has KG of 5 m. She loads 600 Ts of cargo Kg 10 m. Determine the GM_T in Final condition if the FSM of the ship was 156 TM.

Q. 6 Describe the SOLAS requirements for a transverse watertight bulkhead of a cargo ship :
a) Minimum number b) Location c) Initial tests

Q. 7 a) Describe various surveys and their frequency with respect to "Harmonised system of survey" for a general cargo ship.
b) Describe the procedure for preparing the vessel for safety construction (SAFCON) renewal survey.

Q. 8 Write short notes on :
a) Thermit welding
b) MIG Welding
c) Importance of flux in welding

Q.9 What is galvanic cell in terms of corrosion? Describe SACP or ICCP methods of corrosion prevention.

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

TIME: 3 HOURS **PASS MARKS: 120** **MAX MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each
2. Attempt any four out of five from Part B (Each question carries 20 marks)
3. Whenever applicable sketches should be drawn to support the answer

PART – A

Q. 1 A ships water plane is 80m long the breadths commencing from fwd are as follows 0, 3.05, 7.1,9.4,10.2,10.36,10.3,10.0,8.84,5.75 and 0 m respectively. The space between the first three and last three ordinates is half of the other ordinates. Calculate the area of water plane and its position of the centre of floatation.

Q. 2 M.V Hindship displacing 9500 t and trimmed 0.80 m by stern is to be dry-docked for bottom inspection. KG=7.92m FSM = 1600 tm Calculate
a) The GM(F) of the vessel before entering the dry-dock
b) The virtual GM of the vessel when her heel takes blocks all along the length of the vessel

Q. 3 A ship has displacement 15000 MT KG=7.0M

HEEL	0	15	30	45	60
GZ	0	0.38	1.0	1.41	1.2

The vessel has loaded to this displacement but the KG is found to be 6.8 m. Draw the amended GZ curve and estimate the dynamical stability at 60°.

Q.4 a) Sketch a power operated watertight door.
b) Enlist the routine inspection requirements to ensure the trouble free operation of these doors.

PART - B

Q. 5 Discuss the effect of change in the Density of water in which a ship is floating on:
i) Trim ii) GZ values iii) LCG

Q. 6 a) Describe testing requirements of main W/T compartments on cargo ships.
b) Write short notes on (i) Water tight (ii) Weather tight (iii) Oil tight

Q. 7 For which type of ship is "The Enhanced system of Survey" compulsory? Briefly describe the system.

Q. 8 a) Using diagrams, explain the defects in welding and how they are tested.
b) State how these defects can be minimized by good welding practices.

Q.9 Describe how corrosion is controlled on board the ship under following headings :
a) Protective Coating
b) Cathodic Protection

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

03/10/17

TIME: 3 HOURS **PASS MARKS: 120** **MAX MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B (Each question carries 20 marks)
3. Whenever applicable sketches should be drawn to support the answer.

PART – A

Q.1 A 40m long, 9m broad, 6m deep barge consists of triangular cross-section with apex down. The barge displacing 492t, KG 1.8m is floating in SW. Calculate her MCTC in the given conditions.

Q.2 The TPC of a vessel at various drafts are as below:

Draft (m)	0.0	1.0	2.0	3.0	4.0	5.0	6.0
TPC	18.90	19.62	20.28	20.90	21.62	22.08	22.47

If 6.0m is the summer draft, find the summer displacement of the vessel and tropical drafts.

Q.3 M.V. Hindship arrives SW anchorage in condition no. 5. She berths alongside a berth in DW of RD 1.003. Neglecting consumption from anchorage to berth, calculate the drafts when alongside.

Q.4. Draw and label the ramp of a ro-ro vessel.

PART – B

Q.5. Describe the stability criteria to be satisfied by vessels carrying Grain cargo in bulk as required by International Code for Safe Carriage of Grain in Bulk.

Q.6 (a) Describe the various categories of water-tight doors - Class 1, Class 2 and Class 3.
(b) Describe the requirement of inspection and drills applicable to W/T doors and record keeping of the same

Q.7. State the objectives and features of ESP with reference to:
(a) Age of the Vessel (b) Coating Condition (c) Owners / ship officer's responsibility (d) Access to surveyor

Q.8 Describe following in respect of welding:
(a) Butt weld (b) under-cut (c) back-run (d) MIC (e) Flux

Q.9. Good understanding of the galvanic series of metals is vital for protection against corrosion. Discuss its application in context of shipboard measures employed in preventing corrosion of the ship's hull.

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GOVERNMENT OF INDIA
FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)
FUNCTION: CONTROLLING THE OPERATION OF THE SHIPS & CARE FOR PERSONS ON BOARD (Management Level)
PAPER: NAVAL ARCHITECTURE PAPER-I

Code 6/B

4-7-17

TIME: 3 HOURS **PASS MARKS: 120** **MAX MARKS: 200**

Notes:
1. All questions in Part - A are compulsory and carry 30 marks each
2. Attempt any four out of five from Part - B (Each question carries 20 marks)
3. Whenever applicable sketches should be drawn to support the answer

PART – A

Q.1 A vessel's GZ values for various angles of heel are as follows

Heel (°)	15	30	45	60	75	90
GZ(m)	0.391	1.0	1.138	0.774	0.129	-0.584

Cargo is then redistributed causing the C.G to rise by 0.25m. Draw her curve of statical stability for the new condition and from the curve, find the following
a) An estimate of her GM b) Her range of stability c) Max. GZ and angle at which it occurs

Q.2 A vessel of following particulars enters a seawater dry dock, LBP 140m, Draft forward 3.4m, Aft 5.8m, KG 8.0, KM 9.02m, displacement = 8930t, TPC:21.9t, LCF 72.2m from A.P. MCTC 162.5tm. Find the virtual GM and drafts F & A when the level of water has fallen one meter after stern has taken to the blocks. Given KM at this displacement= 9.18m

Q.3 M.V.Hindship in dockwater of R.D. 1.005 is floating at draft forward 5.74 m, aft 6.92m. Calculate her draft forward and aft if she loads 450t of cargo in No.4 tween deck

Q.4 Sketch and label power operated horizontal sliding doors on board passenger ships. State the SOLAS requirement for such doors

PART B

Q.5 a) Discuss the effect on stability of ship due to increase beam and freeboard
b) Define critical instant, critical period and Declivity of docks

Q.6 a) Explain the intact stability requirement for carriage of grain
b) What is a cofferdam? Where it is fitted and what are its functions?

Q.7 a) Describe the changes Harmonized System of survey and Certification has brought in shipping and how the harmony is achieved?
b) With reference to E.S.P. describe following:
i) Critical Areas ii) Suspect Area iii) Close- up Inspection

Q.8 a) Describe the preparation of plate edge for welding?
b) Describe with sketch any two methods of welding joints in modern ship building?

Q.9 a) Choose a suitable type of paint for the following areas giving reasons for your choice:
i) Main decks ii) Super structure iii) Under - water ship side
iv) Chain lockers v) Ballast tanks
b) What is meant by Sa 2.0 and Sa 2.5?

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

TIME: 3 HOURS **PASS MARKS: 120** **MAX MARKS: 200**

Notes:
1. All questions in Part A are compulsory and carry 30 marks each
2. Attempt any four out of five from Part B (Each question carries 20 marks)
3. Whenever applicable sketches should be drawn to support the answer

PART – A

Q.1 A vessel is loaded with grain in Bulk, of SF 2 m^3/t and has a Displacement = 70000t, KM = 12.2m, FSM = 4000mt. Two holds are partly filled and their combined VHM as read off from curves is 2900 m^4, all other holds are full and their total VHM is 19000 m^4. The KG of the ship calculated assuming the CG of grain in the filled compartments are at the volumetric centroid of each of those compartment is 10.2 m. The angle of flooding is 41°, the KN values for her Displacement are as follows:

Heel	12°	15°	30°	40°	45°	60°
KN	2.75	3.50	7.0	9.40	10.20	11.30

Determine whether the ship satisfies the intact stability criteria for vessel loaded with grain in bulk

Q.2 A ship of Length = 130m, Displacement = 5200t, CF = 2m aft of midship MCTC =140mt, KM = 6.5m, KG = 6.0m, TPC = 20t, draft Fwd = 4.35m, Aft = 5.41m is dry docked. Calculate her residual GM and the drafts F and A
(i) When the trim has reduced to 35 cms
(ii) When the water level has been lowered 1.2 m after she has taken the blocks all over

Q.3 M.V. 'Hinaship' in condition No.8 has to discharge 300 tonnes, prior to sailing. Calculate the position with respect to AP, from where, this weight is to be discharged to enable her to sail trimmed 1.5 metres by the stern. Also find the sailing drafts F & A

Q.4. Sketch and describe the arrangement of ramp doors of Ro-Ro ships and its effect on ships stability

PART – B

Q.5. Discuss the effects of "decreasing beam" and "increasing freeboard" of a ship on her moment of statical stability

Q.6.Write short notes on:
a. Condition Assessment Scheme (CAS)
b. Condition Assessment Program (CAP)

Q.7. a. Describe various surveys and their frequency with respect to the "Harmonized System of Surveys" for a general cargo ship
b. Describe the procedure for preparing the vessel for Safety equipment renewal survey

Q.8. Describe in detail: a. Submerged arc welding b. Faults in Welding

Q.9. Discuss how corrosion is controlled on board the ship under following headings:
i. Protective Coating
ii. Cathodic protection

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

TIME: 3 HOURS **PASS MARKS: 120** **MAX MARKS: 200**

Notes:
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2. Attempt any four out of five from Part B (Each question carries 20 marks)
3. Whenever applicable sketches should be drawn to support the answer

PART – A

Q.1 The fore deck of a vessel is 60m in length. The width of the deck at equal intervals commencing from its fore end are 12.0, 13.5 and 15.8m. Calculate the area and the CG of the area from the fore end of:
(a) Fwd half of the deck
(b) After half of deck?

Q.2 A vessel of Length = 140mt., Displacement = 16000t, MCTC = 190, TPC = 24t, LCF = 72m, KM = 8.20m, KG = 7.20m, FSM = 1370mt.draft = Fwd = 6.68m, Aft = 8.84m grounds on an isolated rock, the draft then are fwd 5.88 and aft 9.28m. Calculate following.
(i) The up thrust provided by the rock
(ii) The position with respect to after perpendicular, where the grounding occurred
(iii) The virtual GM (f) of the vessel then

Q.3 M.V. 'Hindship' in dock water of R.D 1.005 is floating cat draft F: 5.74m, A: 6.92m. Calculate her drafts F & A if she loads 450 t of cargo in No.4 tween deck

Q.4. Sketch and describe a collision bulkhead. State its principal function and location in the ship.

PART – B

Q.5. Discuss the effect of movement of weight both vertically (UP) and transversely on statical stability curve.

Q.6 a. Draw transverse W/T bulkhead of a cargo ship.
b. Describe the SOLAS requirements for such a bulkhead on a cargo ship in respect of:
i. minimum number ii. Location where required and iii. Initial test

Q.7 a. Define and differentiate between statutory and mandatory surveys.
b. Differentiate between the scope of initial survey, intermediate survey, annual survey and renewal survey.

Q.8. Describe in detail: a. Butt weld b. Tack Weld c. Fillet Weld

Q.9. Write short notes on:
a. Types of corrosion
b. Surface preparation of steel
c. Anti - Fouling paint scheme

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3. Whenever applicable sketches should be drawn to support the answer

PART – A

Q.1 The TPC values for a vessel at 1.2 meters intervals of draught commencing from keel upwards are as follows:
8.0, 15.2, 17.0, 18.5, 20.0, 20.6, 21.1 meters respectively
Calculate her displacement at 7.2 meters draught

Q.2 M.V. Hindship is loaded with grain cargo to a draft of F 6.805m, A 8.759m, KG 7.570m, FSC 0.085 m.
(a) Using the table of cross curves of stability particulars, calculate her righting levers up to 40∅ angle of heel.
(b) If Assumed Volumetric Heeling Moment due to assumed shifting of grain cargo of the vessel in the given condition is 3300m4, determine if the vessel meets the permissible heel requirements of International Code for the Safe Carriage of Grain in Bulk if carrying grain cargo of S.F. 1.25 in bulk.

Q.3 A vessel enters a SW dry-dock drawing 4.4m forward and 5.8m aft. KG = 8.6m, FSM = 800 tm, AF = 72.056m, L = 140m, W = 8486.8t, MCTC = 160.952tm, TPC = 21.72, KM = 9.570m. Assuming the hydrostatic particulars remaining unchanged over the range of drafts in question, find the GM when water level falls to 4.8m above the blocks.

Q.4. Draw and label a power operated water-tight door. Also list the SOLAS requirements applicable to the operation of such water-tight doors.

PART – B

Q.5. ((a) A vessel of LCB = 68.023m and LCF = 68.230m goes from DW of RD 1.025 to 1.003. How is the trim of the vessel going to change?
(b) With the help of a diagram, explain how can initial GM be obtained from GZ curve of a vessel?

Q.6 (a) Describe the rule applicable regarding location of collision bulkhead
(b) State the testing requirements for collision bulkhead when:
(i) Not forming part of a tank (ii) Forming part of the bulkhead

Q.7 (a) Explain features of H.S.S.C
(b) Discuss various certificates covered under H.S.S.C, including validity of certificates and types of surveys carried out

Q.8 Describe the various faults in welding.

Q.9 Discuss as to how the Condition Assessment Programme differs from Condition Assessment Scheme

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NOTE – Q 2 (a) 40° (DEG) ANGLE OF HEEL.

3/10/16

GOVERNMENT OF INDIA

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3. **Wherever applicable, sketches should be drawn to support the answer.**

PART – A

Q. 1 The semi ordinates of a b' head 6m in height at 1m interval commencing from the top of the b' head are 4.0, 3.8, 3.5, 3.3, 3.0 and 2.7 m. Below the last ordinate the area of the b' head is 5.0m² with its C.G. = 0.8m from the bottom of b' head. Calculate the area of b' head and the distance of its CG from the bottom of b' head?

Q. 2 A vessel enters a SW dry-dock drawing 4.4m forward and 5.8m aft. KG = 8.6m, FSM = 800 tm, AF = 72.056m, L = 140m, W = 8486.8t, MCTC = 160.952tm, TPC = 21.72, KM = 9.570m. Assuming the hydrostatic particulars remaining unchanged over the range of drafts in question, find the GM when water level falls to 4.8m above the blocks.

Q.3 M.V.'Hindship' arrives port in Condition No.5 and discharges the entire cargo from No.1 TD, No.5 Poop Deck and Refrigerated Cargo Spaces. No.4 DB tank (centre) is filled with water ballast. Calculate her GM (Fluid) and drafts F & A.

Q.4 Sketch a transverse corrugated bulkhead of a bulk carrier showing its connections to the adjoining parts. Label all parts.

PART-B

Q.5 Describe the stability criteria to be satisfied by vessels carrying Grain cargo in bulk as required by International Code for Safe Carriage of Grain in Bulk.

Q.6 During construction and repairs of ship, distortion of welded joints is a common problem. Explain the reasons for the same and how can this be minimized.

Q.7 a) What is enhanced System of Survey? To which ships does this system apply?
b. What documentation is done on board with respect to the above? What is substantial corrosion?

Contd....2.....

Q.8 Good understanding of the galvanic series of metals is vital for protection against corrosion. Discuss its application in context of shipboard measures employed in preventing corrosion of the ship's hull.

Q.9 Describe:

a) Explain procedure for testing of bulkheads .Also, state purpose of wash bulkhead.

b) Discuss the construction of corrugated watertight bulkheads fitted on ships.

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GOVERNMENT OF INDIA

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2. **Attempt any four out of five from Part B. (Each question carry 20 marks)**
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 A D.B. tank is 1.8m deep. The horizontal areas of the tank spaced at equal intervals commencing from the top are $200m^2$, $175m^2$ & $150m^2$ respectively. The tanks contain oil of R.D. 0.88 to a sounding 0.9m. Calculate the weight of oil and its KG.

Q. 2 A box shaped vessel 125m x 20m is in SW at an even keel draft of 3m, KG=4.5. Calculate the draft Fore and Aft if a cargo of 1500 tonnes is loaded on a vessel. (Lcg and Kg of cargo 61m and 4.8m respectively).

Q. 3 M.V. Hindship drafts F: 8.10m, A: 8.50m, KG 7.98m FSM 1750 Tm is floating in salt water. Show by calculations and curve if she complies with ~~Regulation 10 (1) and (2) of the load line convention.~~ INTACT STABILITY CRITERIA.

Q. 4 a) Sketch & describe a typical sliding watertight door fitted on passenger ship.

b) Briefly describe the specification as laid down in SOLAS for such doors.

PART – B

Q. 5 How do the following parameters affect (GZ curve):-
a) Freeboard b) Beam c) Length

Q. 6 a)Describe testing requirements of main W/T compartments on cargo ships.
b) Write short notes on watertight, weathertight, oil tight and corrugated bulkheads.

Q. 7 For which type of ship is " The Enhanced system of Survey" Compulsory? Briefly describe this system. What is substantial corrosion?

Q. 8 Using sketches, explain the defects in welding and how they are tested for. State how these defects can be minimized by good welding practice.

Q. 9 a) How improved design of a ship and its various structures can help reduce corrosion? Describe with suitable examples.

b) How does cathodic protection help reduce shipboard corrosion? Describe all the methods used on board a ship.

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GOVERNMENT OF INDIA

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3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 A bulkhead 12m broad at the top has the following equally spaced vertical ordinates 3.5, 6.0, 6.8, 6.0 3.5. Calculate the area and COG of the bulkhead from bottom.

Q. 2 A vessel of L=150mt, CF=2m fwd of midship W=8000t, KM=7.5m, KG=6.8m, TPC=20t, MCTC = 160 m.t at a draft of 5.20m, fwd and 6.89m aft, is floating in a dry dock, where the water level is 7.4m above the top of the blocks. Calculate her virtual GM and draft Fwd and Aft when the water level is lowered by 1.4m.

Q. 3 M.V. Hindship arrives in water of R.D. of 1.027 with draughts of F/7.00m and A/8.00m. Find her draughts Fore and Aft on berthing in Fresh Water.

Q. 4 Describe the positioning requirement of the collision bulkhead under SOLAS. What does the SOLAS specify about the penetrations in the collision bulkhead?
Draw and label a flat watertight transverse bulkhead.

PART – B

Q. 5 Describe the effect of the following on GZ curve of a vessel:
a) Beam increase b) Free board increase c) Vertical upward shift of vessels centre of gravity

Q. 6 Describe the SOLAS requirements for a transverse watertight bulkhead of a cargo ship w.r.t.:-
a) Minimum number b) Location c) Initial tests

Q. 7 a) Describe various surveys and their frequency with respect to the "Harmonised system of survey" for a general cargo vessel.
b) Describe the procedure for preparing the vessel for safety construction (SAFCON) renewal survey.

Q. 8 Write short notes on the following:
a) Thermit welding
b) MIG welding
c) Importance of flux in welding

Q. 9 Differentiate between corrosion and erosion. List the types of corrosion and explain any four of them with examples.

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Anand kumar Sahu

5/10/15 AM

GOVERNMENT OF INDIA

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3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 A vessel laden with grain in bulk of stowage factor 1.184m³/t has a displacement of 87500 t. Her KG calculated assuming the Cg of the cargoes in the filled holds to be at the volumetric centroid of the compartments is 10.60m. FSM 2643 mt, KM 13.20m. The VHM of all filled holds is 5864 m⁴ and that of a hold which is partly filled is 14400 m⁴. The angle of flooding is 37°.

Her KN values are as follows:

Heel°	12	15	30	40	45
KN (m)	2.730	3.440	6.857	8.584	9.292

Ascertain whether the ship satisfies the stability criteria for vessels laden with grain in bulk.

Q. 2 A vessel has the following particulars: LBP: 140m; MCTC: 130 tm; COF 3m. forward of centre; TPC: 18; Displacement 6240 MT; KM: 6.4m; KG: 5.8m; drafts forward: 5.23m, aft: 5.74m. She grounds lightly on a rock 12m abaft the stem. The tide then falls by 80 cms. Calculate the virtual GM and her drafts forward and aft.

Q. 3 M. V. 'Hindship' in condition No. 3, sustained damage aft. To effect repairs, it is required to reduce the after draft to 4.4m by loading 525 tonnes in the fore part of the vessel. Find how far abaft the fore perpendicular, this weight should be loaded?

Q. 4 Sketch and describe the functioning of a power operated sliding type watertight door.

PART – B

Q. 5 State and explain the conditions necessary from the stability point of view, when carrying out routine dry-docking of a ship.

Q. 6 State the rules and regulations governing the requirement of minimum number of bulkheads on ships. Describe with the help of sketches the strengthening arrangement of the collision bulkhead.

Q. 7 a) What is the significance of Enhanced Survey Programme? What are the contents of a Survey file used for Enhanced survey?
b) List out the various items to be opened and examined in dry dock as part of classification society surveys?

Q. 8 Write brief note on butt, lap and fillet welds. List and describe the main causes of faults in welding and show how they may be overcome by good welding practices.

Q. 9 What is galvanic cell in terms of corrosion? Describe SACP or ICCP methods of corrosion prevention?

GOVERNMENT OF INDIA

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1. **All questions in Part A are compulsory and carry 30 marks each.**
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3. **Wherever applicable, sketches should be drawn to support the answer.**

PART – A

Q. 1 The TPC values of a ship measured from keel upwards at 1.5 m intervals of draught, commencing at the ~~keep~~ keel, area 4.0, 6.1, 7.8, 9.1, ~~19.3~~ 10.3, 11.4 and 12.0 respectively. Calculate at a draught of 9.0 m:
(a) Displacement (b) K B

Q. 2 M.V. Hindship enters a SW dry dock with draft fwd=3.88m and draft aft=5.30m. The water level in the dock is 6m above the blocks. If the water level in the dock is reduced by 1.5m, Find
(a) Virtual GM and (b) drafts forward and aft.

Q. 3 A vessel of L=120m, w=9100t floats at an even ~~keep~~ keel draught of 6.5 m in FW. MCTC=130 tonne m, TPC=16.5t, LCF 0.6 m aft of midships and LCB 2.3m forward of midships. Calculate the new draughts if the vessel moves in to water of density 1.024 t/m3 without change in displacement.

Q. 4 a) Sketch and lable how an opening in a watertight bulkhead , is strengthened.
b) State the advantages of corrugated bulkhead over traditional strengthened water tight bulkead.

PART – B

Q. 5 A vessel on her voyvage at sea has inclined unexpectedly by5 deg. Discuss the various possibilities for this condition.

Q. 6 Explain the Enhanced survey program and the requirements of surveys for a bulk carrier 15 years old.

Q. 7 How do you prepare a vessel for Load Line survey.

Q. 8 Explain the methods of reducing distortion during the welding at a shipyard.

Q. 9 Describe the various types of corrosion and the methods to prevent in time.

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RYAN NORONHA

A-M

B614

GOVERNMENT OF INDIA

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

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PART – A

Q. 1 A vessel's GZ values for various angle of heel are as follows:

Heel^0	00	05	12	20	30	40	60	75
GZ(M)	0.000	0.136	0.315	0.472	0.604	0.631	0.562	0.248

The heeling arm at 0^0 = 0.18m. The angle of flooding is 40^0 and maximum difference between the righting arm and heeling arm occurs at 43^0. Verify whether the vessel satisfies the criteria of a stability for a cargo ship carrying grain bulk (assume the deck edge immerses at 10^0 heel).

Q. 2 A vessel of L=140m , W=16000t, MCTC=190mt, TPC=24t, LCF=72m, KM=8.20m, KG=7.2m, FSM=1370mt. draft FWD=6.68m, Aft=8.84m, Grounds on isolated rock, the draft then are FWD 5.88 and Aft 9.28m Calculate following:

i) The up thrust provided by the rock 475.2
ii) The position with respect to after perpendicular, where the grounding occurred. 121.58
iii) The virtual GM (F) of the vessel then. 0.694 Stbd
iv) The angle of heel if she had grounded 3m to ~~stabled~~ of centerline 7.3° (S)
v) The rise in tide required for the vessel to refloat

Q. 3 M.V. Hindship is at even keel draft of 9.35m in dock water of RD 1.004. Calculate her drafts F & A on reaching the sea. Assume fuel and Fresh water consumption negligible.

Q. 4 Sketch a transverse corrugated bulkhead of a bulk carrier showing Its connection to the adjoining parts. Label all parts.

PART – B

Q. 5 "GM alone is not the adequate measure of stability of ship" justify the above Statement with sketches.

Q. 6 a) Enumerate the SOLAS requirements of a power operated door.
b) Explain with sketches how a watertight bulkhead is connected with deck.

Q. 7 a) Differentiate between harmonized and enhanced survey programs.
b) With respect to enhanced survey program write notes on :
i) Substantial corrosion ii) Documentation iii) Close Inspection

Q. 8 Describe the following welding methods used in ship building
i) Electric arc welding ii) Tungsten inert gas welding(TIG)

Q. 9 Describe the various types of corrosion on board. How will you deal with Ship-board corrosion?

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GOVERNMENT OF INDIA

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PART – A

Q. 1 A vessel of length 140 mts. CoF = 2.5 mtrs forward of midship, MCTC = 150, TPC = 19, KM = 7.6m, KG=6.8m W = 11,100 T, at a dft F=3.70m A=5.69m is floating in a dry dock where depth of water is 6.6 m above the top of the blocks. Calculate vessels residual GM and drafts F & A:-

When :- a) V/L is at critical instant
b) W/L is lowered by 1.6 m

Q. 2 The half – breadths of a ship's water – plane, L=100m, from aft, are: 0.0, 3.3, 4.5, 4.8, 4.5, 3.6, 2.7 & 1.5 meters.
The half – breadth, midway between the first two from aft, is 2.0m. At the forward end, is appendage by way of a bulbous bow 4.4 m log. Its area is $20m^2$ and geometric centre, 1.4m from the forward extreme. Find the area of the water plane and the position of the COF.

Q. 3 M.V. Hindship berthed in DW of RD 1.006 at a draft of F: 7.86m A: 8.33m, KG=7.41m, FSM = 970tm. She discharged 405 t of cargo from No. 2 TD. Calculate the drafts F & A at which she would sail.

Q. 4 a) Draw and lable a neat diagram of a flat Transverse Water – tight Bulkhead.
b) What area the requirements as per SOLAS regarding pipes piercing the collision bulkhead?

PART – B

Q. 5 a) Briefly enumerate the information available to you as a mate from Curve of Statical stability.
b) Draw a Port and stbd GZ Curve for
(i) an unstable vessel (ii) a stable but listed vessel.

Q. 6 Explain how an upright vessel with slight initial stern trim experiences a change of Trim when (i) moving from SW to RW (ii) moving from RW to SW.

Q. 7 Write short notes on following :
a) Distortion and preventive measures in shipyard welding practice
b) Importance of flux in welding

Q. 8 a) Discuss the different types of corrosion taking place on board ships.
b) Write down the components of a marine paint and their importance. Give examples.

Q. 9 a) Discuss the defects of welding.
b) Write notes on : i) Submerged Arc welding ii) T.I.G. welding.

GOVERNMENT OF INDIA

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PART – A

Q. 1 M.V. Hindship in Condition No. 6 has 300t of cargo to shift horizontally 7.0m and vertically downwards 4.0m. Draw the GZ curve up to 40° after the shift has taken place and estimate the resulting list.

Q. 2 The water plane areas of a ship are

Draft	5	4	3	2	1	m
Area	2100	2050	2010	1900	1710	m^2

Between keel and 1m draft the appendage volume is 700m^3 whose geometric centre is 0.6m above the keel. Find the displacement, KB and FWA of ship at draft 5m in S.W.

Q. 3 A vessel of L=140mt, W=16000t, MCTC=190tm, TPC=24T, LCF=72m, KM=8.20m, KG=7.20m, FSM=1370mt, draft=FWD=6.68m, Aft=8.84m grounds on an isolated rock, the draft then are fwd 5.88m and aft 9.28m. Calculate following:

i) The up thrust provided by the rock.
ii) The position with respect to after perpendicular, where the grounding occurred.
iii) The virtual GM (f) of the vessel then.
iv) The angle of heel if she had grounded 3m to stbd of centre line.
v) The rise in tide required for the vessel to refloat?

Q. 4 a) Describe a corrugated water tight bulkhead of a ship.
b) With the help of a sketch explain a remote controlled water tight door.

PART – B

Q. 5 a) What are the reasons for desirability of dry docking with a small stern trim?
b) What precautions will you take for dry docking a loaded ship?

Q. 6 a) Explain Condition Assessment Scheme (CAS) & Condition Assessment Programme (CAP).
b) State the regulations regarding minimum number of bulkheads & their locations?

Contd....2...

Q. 7 a) With respect to Enhanced Survey Program, explain:
i) Substantial Corrosion
ii) Bottom Inspection/Survey
b) Write a brief note on Harmonized System of Surveys.

Q. 8 Using sketches, explain the defects in welding and how they are tested for. State how these defects can be minimized by good welding practice.

Q. 9 a) Describe Electro Chemical Corrosion.
b) Explain precautions to be taken for application of paint by Airless spray Machine.
c) Discuss briefly the developments with regard to features of Anti-fouling paint.

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PART – A

Q. 1 The water plane area of a ship commencing from the load water line to keel spaced 1m apart are as follows:

Area 800 760 700 600 450 & 10 m^2

Midway between the lowest two water planes the area is 180m^2.
Find the displacement in SW and KB.

Q. 2 A vessel of length 124mt W = 7100t, CF = 3m, fwd of midship, MCTC = 120 mt, TPC = 20t, KM = 6.2m, KG = 5.8m, at a draft of 4.0m fwd and 4.9m aft, grounds lightly on a rock 12m abaft her fore end.
Calculate:
(a) The fall of tide that will make the vessel unstable
(b) her draft F and A then.

Q. 3 A ship has displacement 15000t, KG 7.0m.

Heel	0	15	30	45	60
GZ	0	.38	1.0	1.41	1.2

The vessel has loaded to this displacement but the KG is found to be 6.80m.
Draw the amended GZ curve and estimate the Dynamical stability at 60°.

Q. 4 Draw a neat sketch of a Bow door, Ramp and Watertight door as an extention of collision bulkhead on a Ro-Ro vessel.

PART – B

Q. 5 Discuss the effect of change in Length, Breadth and Freeboard on the ship's GZ curve.

Q. 6 Write short notes on:
a) Weather tight bulk heads b) Water tight bulk heads c) Bulkhead deck
d) Wash bulkheads.

Q. 7 Under the system of Harmonized Surveys and Certification, explain how you would prepare for an annual load line inspection

Q. 8 a) With suitable sketches describe ICCP.
b)With suitable sketches, explain common defects in welded joints.

Q. 9 a) With a sketch, describe Corrosion cell.
b) Describe sacrificial system of cathodic protection.

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GOVERNMENT OF INDIA

FIRST MATE OF A FOREIGN GOING SHIP (PHASE – I)

FUNCTION: CONTROLLING THE OPERATION OF THE SHIPS & CARE FOR PERSONS ON BOARD (Management Level)

PAPER: NAVAL ARCHITECTURE PAPER - I

TIME: 3 Hours PASS MARKS: 120 MAX. MARKS: 200

Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B. (Each question carry 20 marks)
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 A vessel laden with grain in bulk of SF 1.2m³/t has a W, 88000t, her KG, calculated assuming the CG's of the cargoes in the filled compartment to be volumetric centroied of those compartments = 10.3m FSM =2650mt KM = 13.0m the VHM of the filled holds is 5800m⁴ and that of partly filled holds is 14500m⁴, the angle of flooding is 38°. The KN values for that Displacement are as follows:

Heel	12°	15°	30°	40°	45°
KN	2.75	3.45	6.86	8.59	9.30

Ascertain whether she satisfies the stability criteria for vessel's laden with Grain in bulk:

Q. 2 A Ship of L = 130m, W = 5200t, CF = 2m aft of midship MCTC = 140mt, KM = 6.5m, KG = 6.0m, TPC = 20t, draft Fwd = 4.35m, Aft = 5.41m is dry docked. Calculate her residual GM and the drafts F and A

i) When the trim has reduced to 35 cms.
ii) When the water level has been lowered 1.2m after she has taken the blocks all over.

Q. 3 M.V.Hindship floating at a draft of F 5.45m, A 6.53m, fills up no.1 DB tank with water ballast, discharges 120t of cargo from no.2 TD, 99.5m Fwd of AP and shifts a 70t parcel of cargo from No.2 TD to no.4 TD. Using the trim tables, determine the final drafts F & A.

Q. 4 Sketch and described a collision bulkhead. State its principal function and location in the ship.

PART – B

Q. 5 Explain how the values of following parameters change with change in vessel's Draughts :

i) KM_T ii) LCB. iii) MCTC iv) LCF

Q. 6 a) Draw a transverse W/T bulkhead of cargo ship.
b) Describe the SOLAS requirements for such a bulkhead on a cargo ship in respect of :
i) Minimum number
ii) Location where required and iii) Initial Tests

Q. 7 With respect to Enhanced Survey programme explain the following :
a) Type of vessels it applies b) Substantial corrosion
c) Bottom Inspection/Survey d) Documentation.

Q. 8 a) Differentiate between Electric Arc and gas welding.
b) What are butt, lap, and fillet welds?

Q. 9 a) Describe typical paint scheme for under water areas, boot topping, top sides and tank interiors.
b) How will you find wetted surface area given the length of the ship and displacement.

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1. All questions in Part A are compulsory and carry 30 marks each.
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3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q.1 A vessel laden with grain in bulk of SF 1.2 m^3/t has a displacement, 88000t, her KG, calculated assuming the CG's of the cargoes in the filled compartment to be at the volumetric centroid of those compartments = 10.30 m. FSM = 2650 m, KM = 13.0 m, the VHM of the filled holds is 5800 m^4 and that of partly filled holds is 14500 m^4, the angle of flooding is 38°. The KN values for that displacement are as follows:

Heel	12°	15°	30°	40°	45°
KN	2.75m	3.45m	6.86m	8.59m	9.30m

Ascertain whether she satisfies the stability criteria for vessel's laden with grain in bulk.

Q.2 An oil tanker displacing 6000m^3 floats at drafts F: 5.1m, A: 5.8m. The vessel grounds on a falling tide, on a rock, at a position 28m forward of amidships. Calculate the up-thrust force on the ship's bottom and the F & A drafts after the tide has fallen by 25 cms. The hydrostatic curves of the vessel for the above drafts show the following data; LBP = 166m, Centre of Floatation 6m abaft amidships. Water Plane Area = 1850 m^2, GM_L = 550m.

Q.3 M. V. 'Hindship' in Condition No.3 is listed 3° to starboard. It is desired to increase her trim to 3 metres by the stern and to bring her upright by transferring water ballast from No.2 DB tanks to No.4 DB tanks P and S only. Calculate the final distribution of water ballast in No.2 and No.4 DB tanks to achieve this, with No.4 Port filled to capacity. Assume Cgs of No. 2 and No. 4 (P &S) tanks are 6.7 metres from the center line.

Q.4 Draw a neat sketch of a Bow door, Ramp & Watertight door as an extension of collision bulk head on a Ro-Ro vessel.

PART – B

Q. 5 a) Why does a vessel have small Stern trim at the time of dry docking?
b) How will you dry dock a loaded ship?

Q. 6 a) Draw a transverse W/T bulkhead of a cargo ship.
b) Describe the SOLAS requirements for such a bulkhead on a cargo ship in respect of I) Minimum Number II) Location where required and III) Initial tests

Contd....2...

(2)

A-M

7/4/14

Q.7 a) What is an Enhanced Survey Programme? What is the purpose and for which kind of vessel it is applicable?
b) Describe: I) Substantial corrosion as per Enhanced Survey Programme.
II) Frequency of bottom survey / Inspection as per Enhanced Survey Programme.

Q.8 Explain the following:
a) MIG welding b) Method of testing a weld joints

Q.9 a) How improved design of a ship and its various structures can help reducing corrosion? Describe with suitable examples.
b) How does the cathodic protection help reduce shipboard corrosion? Describe various such methods used on board a ship?

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GOVERNMENT OF INDIA

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1. All questions in Part A are compulsory and carry 30 marks each.
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3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 The fore deck of a vessel is 55m in length. The width of the deck at equal intervals commencing from its fore end are 12.2, 13.7 & 16.0m. Calculate the area and the CG of the area from the fore end of the deck?

Q. 2 A vessel of following particulars is to be dry-docked.
Displacement = 28200t, LBP = 174m, KM = 11.43m, KG = 10.9m, Draft forward = 7.92m, Draft aft = 9.30m, LCF 88.5m forward of AP, MCTC=400.5tm, TPC = 28.1 t / cm.
The depth of water in the dock is initially 10m. Find the effective GM of the vessel after the water level has fallen by 1.2m in dock. Also find the drafts F & A after the fall of water level.

Q. 3 M.V. 'Hind ship' in Condition No.3, sustained damage aft. To effect repairs, it is required to reduce the aft draft to 4.5 m by loading 510 tonnes in the fore part of the vessel. Find how far abaft the fore perpendicular, this weight should be loaded? [achieved, desired draft]

Q. 4 a) Draw a neatly labeled sketch of a power operated sliding watertight door on a Passenger ship.
b) Describe the inspection requirements for such doors as per SOLAS.

PART – B

Q. 5 Compare the stability of:
a) A vessel dry docking with no cargo on board and the same vessel dry docking with a full load, at same trim.
b) A vessel dry docking with a small trim and the same vessel dry docking with a large trim.

Q. 6 a) Explain the importance of collision bulkhead. Describe with the help of a sketch the extra strengthening required for it.
b) Differentiate between watertight, weather tight and oil tight bulk heads.

Q. 7 State the objectives and features of Enhanced Survey Programme with reference to:
a) Age of the Vessel
b) Coating condition
c) Owners / Ship officer's responsibility
d) Access to surveyor

Q. 8 a) With the help of sketches describe the various faults in welding.
b) Describe any two non destructive methods of testing welds.

Q. 9 a) What is the difference between anti fouling paint and anti corrosive paint?
b) Explain with a sketch, the features of Impressed Current Corrosion Protection System (ICCP).

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Notes:
1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B. (Each question carry 20 marks)
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 A Ship of length 77m is floating in water of RD 1.015. The areas of the transverse cross-sections of the underwater part of the ship, measured at equidistant intervals from forward, are as follows: 450; 510; 610; 730; 800; 820; 750 and 600 m^2. Calculate the displacement and LCB of the ship.

Q. 2 A vessel of displacement 4740 t, mean draft 4.22 m, length 120 m, KM 6 m, KG 5.5 m, CF amidships, TPC 10 t, MCTC 79 tm, is to be dry docked. If the GM on taking the blocks F and A is to be not less than 0.3m, what is the maximum permissible trim by the stern? At what drafts F and A vessel would become unstable?

Q. 3 M.V. Hind ship is at even keel draft of 9.30m floating in fresh water of density 1.000 t/m^3. Calculate her drafts forward and aft, when vessel goes to dock water of density 1.021 t/m^3, assuming negligible consumption of fuel and fresh water. Determine if there is any change in trim and explain the reasons for the same.

Q. 4 a) Sketch and label how an opening is made in a watertight bulkhead?
b) With the help of a sketch describe horizontal sliding watertight door.

PART – B

Q. 5 a) Explain the intact stability requirements for carriage of grain.
b) Explain volumetric heeling moment and its effect on the stability of vessel when the ship is loaded with bulk grain.

Q. 6 Write a note on the problem of openings in weather decks and ship sides for cargo purposes. Show how these openings are suitably fastened for sea.

Q. 7 Enumerate the preparations you would make to prepare a bulk carrier for load line and safety construction renewal survey.

Q. 8 List and describe the destructive and non-destructive methods of testing welds.

Q. 9 Write short notes on the following:
a) Sacrificial anode b) Cavitations
c) Corrosion d) safety precautions when using paints

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GOVERNMENT OF INDIA

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1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B. (Each question carry 20 marks)
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 A ship's water plane is 216 m in length. The half ordinates of the water plane commencing from forward are as follows:
0.4, 4.4, 8.8, 11.0, 11.6, 11.8, 11.6, 9.6, 7.0, 0.4 respectively. The spacing between the first three and last three ordinates is half of the spacing between the other half ordinates. Calculate her water plane area and the position of the CF with respect to the mid length.

Q. 2 M.V. 'Hind ship' in Condition No.7 floating in water of RD 1.025. Rough weather causes 400 tonnes of cargo to shift horizontally through a distance of 8.5 meters and vertically downwards through a distance of 3 meters. Draw the Curve of Statical stability up to a heel of 40° after the shift of cargo has taken place. From the Curve estimate the resulting angle of list.

Q. 3 A vessel of length 174m, displacement 28,200 t, KM 11.43m, KG 10.90m, MCTC 400.5 tm, TPC 28.1 t, LCF 88.5m, is afloat in a dry dock at a draft of F: 7.92 m, A: 9.30 m. The water level is 10 m above the top of the blocks. Calculate her effective GM and drafts F & A when the water level is lowered by 1.2m. Also calculate her forward draft at which the head will take the blocks.

Q. 4 Sketch and describe the arrangement of ramp doors of Ro-Ro ships and its effect on ships stability.

PART – B

Q. 5 Discuss the effect of decreasing beam and increasing freeboard of a ship on her moment of Statical stability.

Q. 6 a) Enumerate the regulation stipulating minimum number of bulkheads required for a ship?
b) Discuss the construction of common watertight bulkheads fitted on ships. Explain their importance in different types of ships.

Q. 7 a) Define and differentiate between statutory and mandatory surveys.
b) Differentiate between the scope of initial survey, intermediate survey, annual survey and renewal survey.

Q. 8 a) Describe the processes involved in automatic welding.
b) Explain the purpose of flux in welding and differentiate between single pass, multi-pass and back run.
c) Describe the role of classification societies in conducting tests for welding.

Q. 9 Distinguish between corrosion and erosion. Describe the various methods of preventing corrosion on board ships.

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1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B. (Each question carry 20 marks)
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 A Ship is floating upright in sea water of density 1.025 t/m^3 on an even keel draft of 7.0m. The TPC's at 1.0m interval are as follows:

Draft (m)	1	2	3	4	5	6	7
TPC (t / cm)	60	60.3	60.5	60.4	60.4	60.2	60

The volume between the keel and 1 m draft is 3022m^3 and its centroid is 0.5m above the keel. Find the ship's KB and displacement at 7.0 m draft?

Q. 2 A vessel floating at drafts: forward: 8.7m, Aft: 9.4m, grounds at a point 30m aft of forward perpendicular. Find the drafts of the vessel and the GM after tide has fallen by 70cm, If MCTC is 340tm, TPC 28, KG 7.6m, KM 8.4m, Length 162m, LCF 78m forward of AP. Displacement 29000t.

Q. 3 M.V. Hind ship is floating in SW with displacement 11000 tons, KG 7.5 m and FSM 1000 tm. A weight of 500 tons is shifted from port to starboard through a distance of 10 m. Draw the full GZ curve and from it calculate the list.

Q. 4 Sketch, label and describe a corrugated watertight bulkhead and its attachments to sides and tank top. List the advantages of corrugated bulkheads over plane bulkheads.

PART – B

Q. 5 Discuss the effect on Statical stability curve for a vessel which is at an angle of loll on the port side. Also suggest the remedial action to be taken explaining the reasons for same.

Q. 6 a) Explain the different categories of water tight doors.
b) Describe the inspection and testing requirements of W/T doors, side scuttles and storm valves on passenger ships.

Q. 7 a) Describe the changes Harmonized System of survey and Certification has brought in shipping and how the harmony is achieved?
b) With reference to E.S.P. describe following:
i) Critical Areas ii) Suspect Areas iii) Close-up Inspection

Q. 8 a) Describe the preparation of plate edge for welding?
b) Describe with sketch any two methods of welding joints in modern ship building?

Q. 9 a) Choose a suitable type of paint for the following areas giving reasons for your choice: i) Main decks ii) Super-structure iii) Under-water ship side iv) Chain lockers v) Ballast tanks.
b) What is meant by Sa 2.0 and Sa 2.5?

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GOVERNMENT OF INDIA

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Notes:

1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B. (Each question carry 20 marks)
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 The breadths of a ship's water-plane 120 m long, measured at equal intervals from aft, are: 1.2, 9.6, 13.2, 15.0, 15.3, 15.6, 15.6, 14.7, 12.9, 9.0 and 0.0 m respectively. Find the water plane area, TPC in sea water & FWA if displacement is 6,690 t.

Q. 2 A vessel of displacement 7200 tonnes. Length 120m, MCTC 110tm, KG 6.0m, KM 6.4m, TPC 16 tonnes, center of floatation 2 mts forward of mid-ship, grounds on a rock 10 mts. abaft her forward perpendicular. Given initial draft F: 4.2m, A: 5.1m.
a) Find the fall in tide which will make the vessel unstable?
b) What will be the drafts forward and aft at that moment?

Q. 3 M.V. 'Hindship' berthed in a dock where RD of water is 1.007, at a draft of F: 7.87 m, A 8.32 m, KG 7.45 m, FSM 970 mt. She discharged 410 t of cargo from 2 TD. A 60 t case is shifted from deck, Kg 14.7 m, LCg 58.6 m to No.2 Hold. 110 t water kg 2.77 m, LCg 16.23 m was received in No.8 (P&S) tanks, filling them completely. Calculate the draft F & A at which she would sail from the dock.

Q. 4 Sketch and label a power operated horizontal sliding door, on board a passenger ships. State the SOLAS requirement for such doors.

PART – B

Q. 5 a) Discuss the effect on stability of ship due to increased beam and freeboard.
b) Define critical instant, critical period and Declivity of docks.

Q. 6 a) Explain the intact stability requirement for carriage of grain.
b) What is a cofferdam? Where is it fitted and what are its functions?

Q. 7 a) Explain what is 'Close up inspection' and 'Critical areas' with reference to Enhanced Survey program. Describe the contents of 'Documents File'.
b) Write short notes on Condition Assessment Scheme (CAS)?

Q. 8 a) List various types of welding.
b) Write short notes on weld faults?

Q. 9 a) Describe the methodology of selecting a suitable protective coating for different areas of ship in order to minimize the effects of marine corrosion.
b) Write down the components of marine paint and their importance.

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hard ✓
audible ✓
indication ✓
closing time ✓
closing hard

LCG

$$t = \frac{(LCB - LCG) \times \Delta}{100 \times MCTC}$$

GOVERNMENT OF INDIA

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1. All questions in Part A are compulsory and carry 30 marks each.
2. Attempt any four out of five from Part B. (Each question carry 20 marks)
3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 The fore deck of a vessel is 60m in length. The width of the deck at equal intervals commencing from its fore end are 12.0, 13.5 and 15.8m. Calculate the area and the CG of the area from the fore end with respect to: a) Fwd half of the deck b) After half of the deck

Q. 2 A ship of length 160m, displacement W = 10500t, CF = 3m abaft the mid-ship, MCTC = 160mt., TPC = 18t, KM = 7.0m, Kg = 6.6m at a draft of 6.9m fwd, 7.3m aft, grounds lightly on a rock 14m abaft the fore end. The tide then falls by 90cm. Calculate her virtual GM and drafts fwd and aft then.

Q. 3 M.V. 'Hindship' in Condition No. 3 is listed 4° to starboard. It is desired to increase her trim to 2.95 meters by the stern and to bring her upright by transferring water ballast from No. 2 DB tanks to No. 4 DB tanks P and S only. Calculate the final distribution of water ballast in No. 2 and No. 4 DB tanks to achieve this, with No. 4 Port filled to capacity. Assume Cgs of No. 2 and No. 4 (P & S) tanks are 6.7 meters from the centre line.

Q. 4 Describe the positioning requirements of the collision bulkhead under SOLAS. What does the SOLAS specify about the penetrations in the collision bulkheads? Draw and label a flat watertight transverse bulkhead.

PART – B

Q. 5 Explain how the following parameters change with change in vessel's draft:
a) KM_T b) LCB c) MCTC d) LCF e) TPC

Q. 6 Write short notes on:-
a) Condition Assessment Scheme (CAS)
b) Condition Assessment Program (CAP)

Q. 7 a) Describe various surveys and their frequency with respect to the "Harmonized System of Surveys" for a general cargo ship.
b) Describe the procedure for preparing the vessel for Safety Construction (SAFCON) renewal survey.

Q. 8 Describe in detail: a) Tungsten inert gas welding b) Faults in Welding

Q. 9 a) Describe in brief the possible causes of paint failure.
b) Describe the procedure for surface preparation and painting of hull in dry dock.

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3. Wherever applicable, sketches should be drawn to support the answer.

PART – A

Q. 1 A vessel's GZ values for various angles of heel are as follows

Heel (^{0})	15	30	45	60	75	90
GZ (m)	0.391	1.0	1.138	0.774	0.129	-0.584

Cargo is then redistributed causing the C.G. to rise by 0.25 m. Draw her curve of statical stability for the new condition and from the curve, find the following: a) an estimate of her GM. b) Her range of stability. c) Maximum GZ and angle at which it occurs.

Q. 2 A Vessel of following particulars enters a seawater dry dock. LBP 140m, Draft forward 3.4m, Aft 5.8m, KG 8.0m, KM 9.02m, Displacement = 8930t, TPC: 21.9t, LCF 72.2m from A.P. MCTC 162.5tm. Find the virtual GM and drafts F & A when the level of water has fallen one meter after stern has taken to the blocks. Given KM at this displacement = 9.18m.

Q. 3 M.V. Hindship in dock water of R.D.1.005 is floating at draft forward 5.74 m aft 6.92 m. Calculate her draft forward and aft if she loads 450 t of cargo in No.4 Tween deck?

Q. 4 Sketch a labeled diagram of watertight bulkhead and discuss its constructional and functional aspects. State the advantages of corrugation.

PART – B

Q. 5 A fully loaded ship may roll 25^0 to either side without causes for alarm. However, the ship falling over to an angle of loll of 15^0 to one side is cause for great concern. Justify above statement, supporting your answer with well argument.

Q. 6 a) Describe how anti-fouling paint and anti-corrosive paint acts?
b) Explain the difference between Water tight and Weather tight doors?

Q. 7 a) What is the significance of Enhanced Survey Programme? What are the contents of a Survey file used for Enhanced survey?
b) List out the various items to be opened and examined in dry dock as part of classification society surveys?

Q. 8 Write brief note on butt, lap and fillet welds. List and describe the main causes of faults in welding and show how they may be overcome by good welding practices.

Q. 9 What is galvanic cell in terms of corrosion? Describe SACP or ICCP methods of corrosion prevention?

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1. All questions in Part A are compulsory and carry 30 marks each.
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PART – A

Q. 1 The areas of ship's Water Plane (WP) are as follows:

Draft (m)	0	1	2	3	4
Area WP (m^2)	650	660	662	661	660

Calculate displacement in SW and Fresh water allowance at 4m draft.

Q. 2 A triangular vessel of width 15m and is having a depth of 12m. Find the draft at which the vessel will become unstable if KM of the vessel is 6.675m.

Q. 3 M.V. Hindship floating at drafts F: 7.95m, A: 8.75m, KG 8.0 and FSC 0.09m, runs aground on a sloping beach at the forward end. External soundings showed that the depth of water at the aft end was 2.5m more than at the forward end. If the tide is expected to fall by 1.0m, what will be the new draft and GM (f)?

Q. 4 Sketch and describe the functioning of a power operated sliding type watertight door.

PART – B

Q. 5 State and explain the conditions necessary from the stability point of view, when carrying out routine dry-docking of a ship.

Q. 6 State the rules and regulations governing the requirement of minimum number of bulkheads on ships. Describe with the help of sketches the strengthening arrangement of the collision bulkhead.

Q. 7 a) Describe the frequency of class surveys? How would you prepare your ship for Loadline survey?

b) Write short notes on Condition Assessment Scheme and Condition Assessment Programme?

Q. 8 Describe electric arc welding? What are the faults associated with it and what is the purpose of flux coating on electrodes?

Q. 9 Describe corrosion and its impact on ship's hull and structural members. How will you minimize it? Describe the painting scheme for accommodation decks?

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