

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

**FORCES & MOMENTS**

1. Three weights are placed on a plank. One of 15 kg masses is placed 0.6 meters in from one end, the next of 12 kg masses is placed 1.5 meters in from the same end, and the last of 18 kg masses is placed 0.3 meters from this end. If the mass of the plank is ignored, find the resultant moment about the end of the plank.
2. Explain the meaning and importance of reserve buoyancy and explain the reasons for damage stability requirements.

**CENTROIDS AND THE CENTRE OF GRAVITY**

1. A ship has a displacement of 7000 tonnes and KG= 06 meters. A heavy lift in the lower hold has KG= 03 meters and mass 49 tonnes. Find the new KG when this weight is raised through 1.5 meters vertically and is suspended by a derrick whose head is 17 meters above the keel.
2. A vessel 6000t displacement , kg 7.1m, loads a heavy lift weight 150t by her jumbo derrick whose head is 16m above the keel. If the weight is placed on the tween deck kg 8m find:
  - i. The kg when the weight is hanging 1m above the tween deck and
  - ii. The kg when the loading is over.
3. A ship is lying starboard side to a Quay. A weight is to be discharged from the portside of the lower hold by means of the ship's own derrick. Describe the effect on the position of the ship's centre of gravity during the operation.

**DENSITY AND SPECIFIC GRAVITY**

1. What is Relative density? A tank when full will hold 130 tonnes of salt water. Find how many tonnes of oil relative density 0.909 it will hold, allowing 1% of the volume of the tank for expansion.
2. A deep tank measuring 10m x 16m x 6m has a coaming measuring 4m x 4m x 0.25m. How many tones of oil of relative density 0.92 can it hold if a space equal to 3% of the oil loaded allowed for expansion? What will be the pressure on bottom plate?
3. Oil of relative density 0.75 is run into a tank measuring 6m x 4m x 8m until the ullage is 2 metres. Calculate the quantity of oil the tank can contain.

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

4. Find the pressure on the bottom of a deep tank size 10m x 6m x 5.5m, when it is fully loaded with vegetable oil of RD 0.905, what will be the thrust on the side shell, if the RD of sea water is 1.020?

**LAWS OF FLOTATION**

1. What is reserve buoyancy & TPC? A box shaped barge 55m X 10m X 06m is floating in fresh water on an even keel at 1.5m draft. If 1800 tonnes of cargo is now loaded, find the difference in height of the center of buoyancy above the keel.

2. Find the distance between the centers of gravity and buoyancy of a rectangular log 1.2m wide, 0.6m deep, and of relative density 0.8 when floating in fresh water with two of its sides parallel to the waterline. If BM equal to  $b^2/12d$  determine if this log will float with two of its sides parallel to the waterline.

**DENSITY ON DRAFT AND DISPLACEMENT**

1. Define FWA. Describe the relationship between FWA & TPC.

2. A ship's draft is 6.40 meters forward, and 6.60 meters aft. FWA = 180 mm. Density of the dock water is 1010 kg per cu. m. If the load mean draft in salt water is 6.7 meters, find the final drafts F and A in dock water if this ship is to be loaded down to her marks and trimmed 0.15 meters by the stern. (Center of flotation is amidships).

3. A ship 120m x 17m x 10m has a block coefficient 0.800 and is floating at the load summer draft of 7.2 meters in fresh water. Find how much more cargo can be loaded to remain at the same draft in salt water.

4. A ship arrives at the mouth of a river in water of density 1016 kg/m<sup>3</sup> with a free-board of 'S' m. She then discharges 150 tonnes of cargo, and proceed up river to a second port, consuming 14 tonnes of bunker. When she arrives at second port the free-board is again 'S' m, the density of the water being 1004 kg/m<sup>3</sup>. Find the ship's displacement on arrival at the second port.

5. A ship loads in fresh water to her salt water mark and proceed along a river to her next port consuming 20 tonnes of bunker. At the second port where the density is 1016 kg per cu.m after 120 tonnes cargo have been loaded, the ship again at the load salt water marks, find the ship's load displacement in salt water.

6. A ship of 12000t displacement arrives at the mouth of a river, drawing 10m in SW. how much cargo must she discharge so that her draft in upper river port of RD 1.012 be 10m.

7. Explain the followings:

- a. Dead weight, b. Dead weight aboard, c. Dead weight available

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

**TRANSVERSE STATICAL STABILITY**

1. Write short note: a) stiff ship b) tender ship c) Stable equilibrium d) Unstable equilibrium e) Neutral equilibrium
2. With the aid of suitable sketch, explain what is meant by ‘ Angle of loll’. A ship of 10 000 t displacement has an initial metacentric height of 1.5 m. What is the moment of statical stability when the ship is heeled 10 degree?
3. Explain the meaning and importance of reserve buoyancy. Explain the reasons for damage stability requirements and criteria.

**EFFECT OF FREE SURFACE OF LIQUIDS ON STABILITY**

1. A ship loaded with timber & with timber on deck, berths with an angle of loll away from the quay. From which side should the timber on deck be discharged first and why?
2. A ship leaves port upright with a full cargo of timber, and with timber on deck. During the voyage, stores, bunker & fresh water are consumed evenly from each side. If the ship arrives at her destination with a list, explain the probable cause of the list and how this should be remedied.

**TPC AND DISPLACEMENT CURVES**

1. a) From the following information construct a displacement curve.

Draft (m)		1	2	3	4	5	6
Displacement ( tonnes)	300	1400	3200	5050	7000	9000	

- b) If the ship is floating at a mean draft of 3.2 m, and then loads 1800 tonnes of cargo and 200 tonnes of bunker, and also pumps out 450 tonnes of water ballast, find the new displacement and final mean draft.
  - c) At a certain draft the ship discharged 1700 tonnes of cargo and loaded 400 tonnes of bunkers. The mean draft was found to be 4.5 m. Find the original mean draft.

**FROM CO-EFFICIENTS**

1. a) Define “coefficient of fineness of the water-plane”.
- b) A ship 120m x 17m x 10m has a block coefficient 0.800 and is floating at the load summer draft of 7.2 meters in fresh water. Find how much more cargo can be loaded to remain at the same draft in salt water.

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

2. a) Define “block coefficient of fineness of displacement”.

b) A ship is 100 m long, has 20 m beam, load draft 08 m, light draft 03 m. The block coefficient at the load draft is 0.766, and at the light draft is 0.668. Find the ship’s dead-weight.

3. A ship 100 m long, 15 m beam, and 12 m deep, is floating on an even keel at a draft of 06 meter, block coefficient 0.800. The ship is floating in salt water. Find the cargo to be discharged so that the ship will float at the same draft in fresh water.

4. A ship’s lifeboat measures 10 m X 2.5 m X 1 m. Find the number of persons which may be carried.

5. A ship's length at the waterline is 120 m when floating on an even keel at a draft of 4.5 m. The maximum beam is 20 m. If the ship's block coefficient is 0.75, find the displacement in tonnes at this draft in salt water.

6. A ship 100 m long, 15 m beam, and 12 m deep, is floating on an even keel at a draft of 6 m, block coefficient 0.8. The ship is floating in salt water. Find the cargo to discharge so that the ship will float at the same draft in fresh water.

7. A ship's lifeboat is 10 m long, 3 m beam, and 1.5 m deep. Find the number of persons which may be carried.

**SHIP DIMENSIONS AND FORM**

1. Sketch with labeling the general arrangement plan of a sea going passenger ship?

2. Define the following with suitable diagram:

a. Camber, b. Sheer, Tumble Home c. Length Overall, d. Forward Perpendicular, e. Freeboard,

3. Write short note on the followings with suitable sketch:

a. Deck Line, b. Bitter End, c. Camber, d. Rudder Trunk, e. Rise of floor

4. Write short note with sketch: a) Bar keel b) Flat plate keel c) Duct Keel. d) Beam Knee

5. What are the information available in ships docking plan.

6. Write short note on the followings with suitable sketch:

a. Deep tank, b. Wash plate, c. Double hull construction, d. Steering gear

7. Write short note: a) Fire wallet b) ISC d) Residual tank e) SBT

8. Sketch with labeling the Mid Ship section of Gas carrier.

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

9. Sketch with labeling the Mid Ship section of large oil tanker.
10. Sketch with labeling the general arrangement plan of a sea going Container ship?
11. Describe how to secure anchors and make spurling pipes watertight in preparation for a sea passage. Describe with suitable sketch the construction and use of a cable stopper.
12. Sketch the general arrangement of a RO-RO vessel

**SHIP STRESSES**

1. State the elements of the ships structure which are critical to the safety of the ship.
2. Sketch corrugated bulkhead. Explain why transverse bulkheads have vertical corrugation and fore and aft bulkheads have horizontal one.
3. Describe with suitable sketch 6 degrees of freedom of a ship.
4. Describe stresses caused by localized loading. Describe with sketches the arrangement made in the bottom construction of a container vessel to compensate for high stake weights.
5. Describe interaction between two ships moving in close proximity in shallow water.
6. Explain the meaning of Hogging and Sagging of ships. Describe the causes of hogging and sagging and its effect on ship.
7. Define squat. Explain why the draft of a ship increases while passing shallow water areas. Explain the relation between UKC and SQUAT?
8. Write short note: a) Bending moment b) shearing Forces
9. Explains how hogging and sagging stresses result in tensile or compressive forces in the deck and bottom structure.
10. Describes qualitatively the stresses set up by liquid sloshing in a partly filled tank.
11. Describes racking stress and its causes. Explains what is meant by 'pounding' or 'slamming' and states which part of the ship is affected.
- 12 Sketch corrugated bulkhead. Explain why transverse bulkheads have vertical corrugation and fore and aft bulkheads have horizontal one

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

**HULL STRUCTURE**

1. Write short note: a) Freeing port b) Scupper c) Bull-work d) Deck Edge immersion e) Fish plate
2. Explains why transverse bulkheads have vertical corrugations and for —and—aft bulkheads have horizontal ones.
3. Describes the purpose of bilge keels and how they are attached to the ship's side.
4. Describes the stress concentration in the deck round hatch openings.
5. Describes with aids of sketches the longitudinal, transverse and combined systems of framing on transverse sections of the ships.
6. Write short note:  
a) Flat plate b) Offset bulb plate C) Equal angle d) Unequal angle e) Channel f) Tee
7. What is framing system? With suitable diagram describe transverse framing system.
8. Sketch the double-bottom structure of a general cargo ship built with transverse framing with labeling.
9. Describe the painting arrangement of the ship with a suitable diagram.
10. Describe constructions of water-tight bulkhead with the aid of suitable sketch.
11. Describe the hold draining system of a general cargo vessel with associate structure.
12. Describe the deck edge, showing attachment to sheer strake and stringer plate.
13. Distinguish between longitudinal and transverse framing system.
14. Distinguish between single bottom and double bottom.
15. What is position 1 and position 2 in regard to hatch coaming height.
16. What is hopper tank and topside tank? State their purpose.
17. How the container ships are protected against torsion?

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

18. Draw the midship section of a bulk carrier.
19. What are relative advantages of corrugated bulkhead over plain bulkhead.
20. Write short note on collision bulkhead.
21. Write short note on shaft tunnel.
22. . Write short note: a) Bar steam b) Bulbous bow. Describe with sketch the Panting arrangements at fore end of ship.

**BOW & STERN**

1. Describes the function of the stern frame.
2. Describes and illustrates the construction of a transom stern, showing the connections to the stern frame.
3. With a suitable sketch describe the “Bitter End” of anchor cable and function of Bitter end.
4. Describe how to secure anchors and make spurling pipes watertight in preparation for a sea passage. Describe with suitable sketch the construction and use of a cable stopper.
5. Briefly describe the construction of a chain locker.? How the chain is cleaned in the hawse pipe?
- 6.

**FITTINGS**

1. Describes the cleating arrangements for the hatch covers.
2. Write short note: a) roller, b) multi—angle, c) pedestal and d) Panama fairleads
3. Describe the function of PV valve of tanker & why it is important for cargo operation.
4. Describes the construction of chain lockers and how the bitter-ends are secured in the lockers.
5. Describes with the aid of sketch the bilge piping system of a cargo ship.

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

6. Describes the arrangement of fittings and lashings for the carriage of containers on deck.
7. Outline the pilot boarding arrangement. what is the SOLAS requirement for pilot boarding arrangement?
8. State causes of corrosion in Cargo spaces and Ballast tanks and how corrosion can be identified and prevented.
9. Describe the arrangement of a FIRE MAIN with main fire pump. Describe SOLAS Requirements for Emergency Fire Pump.
10. What type of fixed fire fighting extinguishing system used at paint locker describe with suitable sketch.

**RUDDERS AND PROPELLERS**

1. Sketches the arrangement of an oil—lubricated stern tube and tail shaft, describes how the propeller is attached to the tail shaft.
2. Describes the rudder trunk.
3. Write short note: a) boss b) rake c) skew d) face e) back f) tip g) radius h) pitch
4. Explains why the shaft tunnel must be of watertight construction and how water is prevented from entering the engine—room if the tunnel becomes flooded.
5. Explain the types of RUDDER normally used onboard ships. Describe the most commonly used type on board merchant ship.
6. Explain different types of rudder with suitable sketch.
7. Distinguish between a right and left handed propeller.
8. Distinguish between a fixed pitch and controllable pitch propeller.

**LOAD LINES & DRAUGHT MARKS**

1. Explains how the chart of zones, areas and seasonal periods is used to find the applicable load line.
2. Explains that the freeboard, measured from the upper edge of the deck line to the water on each side, is used to check that the ship is within its permitted limits of loading.



**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

3. Draw the loadline diagram of a 99.5m vessel long seen from port side.
4. What do you understand by statutory free board and deck line?
5. Outline the requirements relevant to the Conditions of assignment of freeboards under the International Load line regulations.
6. Under the International Load line regulations, define the following :  
Type 'A' ship , Type 'B' ship, Type 'B-60' ship & Type 'B-100' ship.
7. Distinguish between Tabular, Basic and Assigned freeboards.
8. A ship floating in dock water of density 1005 kg per cu. m has the lower edge of her Summer load line in the waterline to starboard and 50 mm above the waterline to port. FWA 175 mm and TPC 12 tonnes. Find the amount of cargo which can yet be loaded in order to bring the ship to the load draft in salt water.
9. A ship is floating at 8 metres mean draft in dock water of relative density 1.01. TPC 15 tonnes, and FWA 150 mm. The maximum permissible draft in salt water is 8.1 m. Find the amount of cargo yet to load.
10. A ship's light displacement is 3450 tonnes and she has on board 800 tonnes of bunkers. She loads 7250 tonnes of cargo, 250 tonnes of bunkers, and 125 tonnes of fresh water. The ship is then found to be 75 mm from the load draft. TPC 12 tonnes. Find the ship's deadweight and load displacement.
11. A ship has a load displacement of 5400 tonnes, TPC 30 tonnes. If she loads to the Summer load line in dock water of density 1010 kg per cu. m, find the change in draft on entering salt water of density 1025 kg per cu. m.

**WELDING, RIVETING AND PRECAUTION DURING WORK**

1. Describe different types of welding. How you will minimize distortion effect on welding?

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

2. Write Short note: a) Hard Spots b) Notches.
3. Describe precautions to be taken during welding. Explain the basic knowledge of riveting.
4. Describe the different types of Welding faults. List the common welding defects.
5. Describe the gas welding procedure, what are the precautions to be require during gas welding?
6. Describe the danger associated during welding and gas cutting.
7. What are factors that affect the weld quality.
8. Describe the working principle of ultrasonic testing of welds.
9. What are hazards associated with radiographic test.

**INSPECT AND REPORT DEFECTS AND DAMAGE TO CARGO SPACES, HATCH COVERS AND BALLAST TANKS**

1. Describe the requirement of enclosed space rescue operation. What are the safety items require for ES (enclosed space) rescue operation.
2. Describe the testing method for hatch cover.
3. Identify the critical components of a hatch covers that contribute to weather tightness.
4. Describe a 'Permit to work' system? State five examples where permit to work system should be used.
5. What is fire watch? What are the things an OOW should check during fire round while discharging dangerous cargo in port?
6. Describe the safety procedure during entering into cargo tank for inspection.
7. How the steel hatch cover is made weather tight?
8. Distinguish between weather tightness and water tightness.

**ENHANCED SURVAY PROGRAM**

1. State the purpose of the "Enhance Survey Programme". State the purpose and contents of the "Planned

**CLASS-3**  
**GENERAL SHIP KNOWLEDGE**

Maintenance Schedule”.

2. Describe the arrangements and procedures for rescue of person from an enclosed space during emergency.

**DAMAGE REPORT**

1. Lists the evidence that needs to be collected in assisting the preparation of a damage report.
2. How to prepare a damage report, if the cargo tank damage during cargo operation?

**MISCELLANEOUS**

1. State the Annexes that are listed under the MARPOL 73/78 convention.
2. Onboard the ship which regulation deals with the garbage? How you will manage garbage onboard ship?
3. Outline the garbage discharging criteria to sea as per Annex- V.
4. Explain maintenance procedure for LSA and FFA equipment on board.
5. What is fire watch? What are the items an OOW should check during fire round.
6. Describe topping off.
7. Describe the preparation of securing ship for rough sea.
8. Describe the causes of corrosion onboard and the various methods that are used to minimize the effect of corrosion.
9. What are the danger associated with mooring station? Describe proper PPE for mooring station.
10. Describe SOLAS requirements of SCBA.
11. What do you mean by SWL and WLL? Why are they important to consider during mooring operation?  
What are the functions of chain stopper?
12. Sketch and describe the strum box, mud box and non-return valve.
13. State the contents of the capacity plan, docking plan and the shell expansion plan
14. Describe interaction between two ships moving in close proximity in shallow water

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