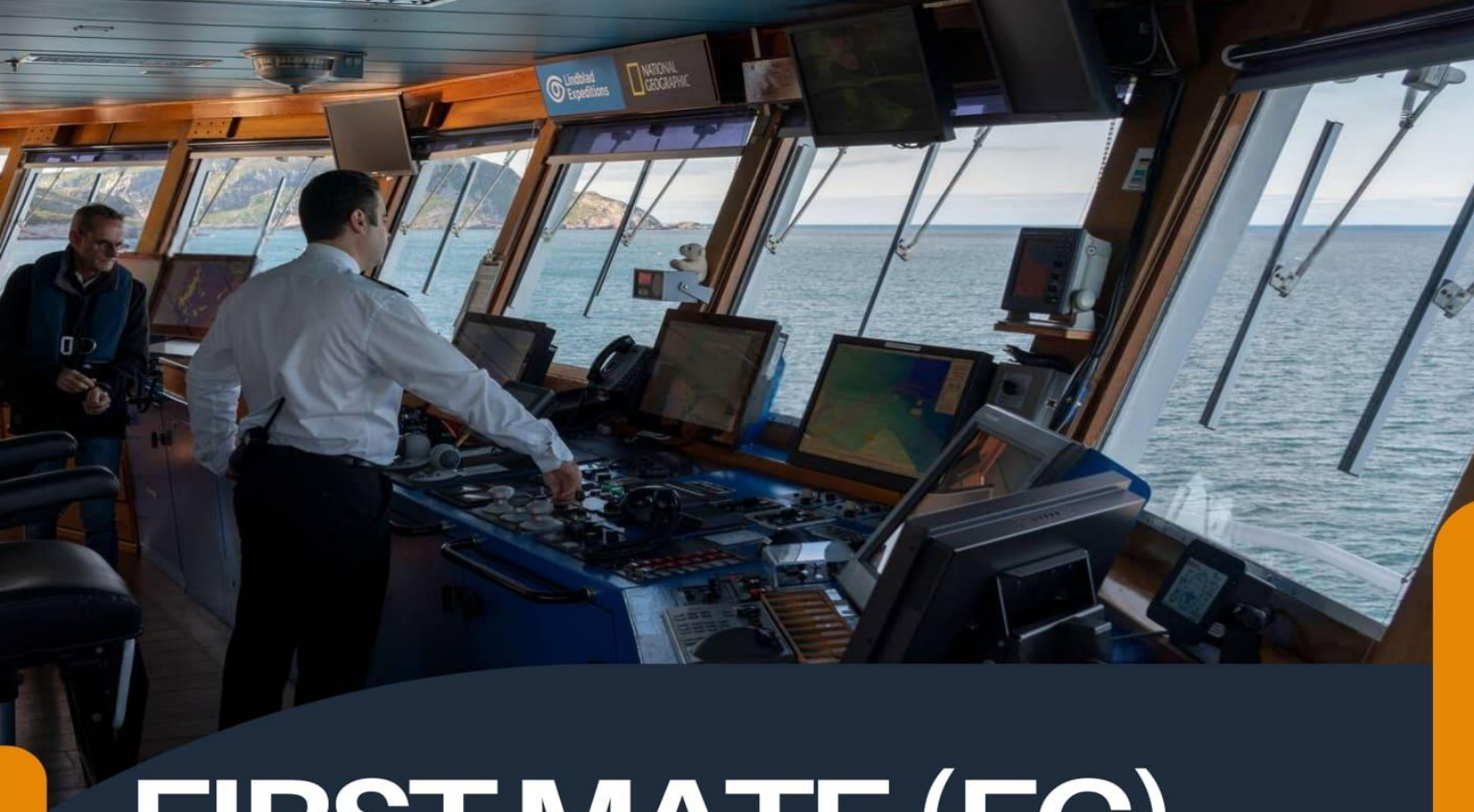

FIRST MATE (FG) PHASE- I WRITTEN :

NAVAL -ARCHITECTURE (FG)

FOR INDIAN COMPETENCY EXAM

D. MARINE
Study Material

www.dmarinestudy.com

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

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.
Click Here to See the Answer

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.
Click Here to See the Answer

Q.3 A vessel laden with grain in bulk of SF 1.2 m3/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 m4 and that of party filled holds is 14500 m4. The KN values for that displacement are as follows:
Heel 12^0 15^0 30^0 40^0 45^0
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 41^0. Angle of heel having maximum difference between righting arm and heeling arm is 46^0
Click Here to See the Answer

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.
Click Here to See the Answer

PART – B

Q.5 Explain how a vessel changes for draft when she goes from sea water to fresh water.
Click Here to See the Answer

Q.6 Draw and explain the Curve of Statical-Stability for a listed ship and the ship at angle of loll.
Click Here to See the Answer

Q.7 Explain how the "Enhanced Survey Programme" has been helpful in making the ships safer.
Click Here to See the Answer

Q.8 Explain the various methods used for testing weld joints.
Click Here to See the Answer

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?
Click Here to See the Answer

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

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 3044m2, and its centre of gravity is 0.5m above the keel. Find the ship's KB.
Click Here to See the Answer

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.
Click Here to See the Answer

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.
Click Here to See the Answer

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

PART – B

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

Click Here to See the Answer

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.
Click Here to See the Answer

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.
Click Here to See the Answer

Q.8 Explain the destructive methods used for testing weld joints.
Click Here to See the Answer

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?
Click Here to See the Answer

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

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 1.2m3/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 m4 and that of partly filled holds is 14500 m4, the angle of flooding is 38O. The KN values for that W are as follows:
Heel 12^0 15^0 30^0 40^0 45^0
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.
Click Here to See the Answer

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.
Click Here to See the Answer

Q.3 M.V. Hindship at a displacement of 13750 t, KG 7.32m, FS Moment 1146 mt, is listed 2½O 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.
Click Here to See the Answer

Q.4 Sketch and describe the arrangement of ramp doors of Ro-Ro ships and its effect on ships stability.
Click Here to See the Answer

PART – B

Q.5 Sketch and describe a collision bulkhead. State its principal function and location in the ship.
Click Here to See the Answer

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
Click Here to See the Answer

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?
Click Here to See the Answer

Q.8 a) Describe submerged arc welding?
b) Describe the various welding faults.
Click Here to See the Answer

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.
Click Here to See the Answer

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

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.
Click Here to See the Answer

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 5O to port at low water.
Click Here to See the Answer

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.
Click Here to See the Answer

Q.4 Sketch and label the mid-ship section of a bulk carrier.
Click Here to See the Answer

PART – B

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

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.
Click Here to See the Answer

Q.7 Explain how you would prepare a ship for a Safety Construction Survey.
Click Here to See the Answer

Q.8 Describe the welding faults and how they can be detected.
Click Here to See the Answer

Q.9 Describe the various methods of corrosion prevention.
Click Here to See the Answer

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

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.
Click Here to See the Answer

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.
Click Here to See the Answer

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.
Click Here to See the Answer

Q.4 Draw and label a plain water tight bulk head showing end – on view.
Click Here to See the Answer

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.
Click Here to See the Answer

Q.6 Discuss as to how the Condition Assessment Programme differs from Condition Assessment Scheme.
Click Here to See the Answer

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

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.
Click Here to See the Answer

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

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

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 GMT.
b) Her maximum righting lever and the angle of heel at which it occurs.
c) Her range of positive stability.
Click Here to See the Answer

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.
Click Here to See the Answer

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 m2, 2400 m2, 2800 m2, 3100 m2 and 3400 m2 respectively.
If from keel to 1 m draft is a Triangular appendage of volume 700 m3, determine
i) Displacement of ship at 5 m draft in S.W.
ii) KB of ship at 5 m draft.
Click Here to See the Answer

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.
Click Here to See the Answer

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

Click Here to See the Answer

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?
Click Here to See the Answer

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.
Click Here to See the Answer

Q.8 Write short notes on:
a) Thermit welding
b) MIG Welding
c) Importance of flux in welding
Click Here to See the Answer

Q.9 What is galvanic cell in terms of corrosion? Describe SACP or ICCP methods of corrosion prevention.
Click Here to See the Answer

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

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.
Click Here to See the Answer

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
Click Here to See the Answer

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.
Click Here to See the Answer

Q.4 Draw and label the ramp of a Ro-Ro ship.
Click Here to See the Answer

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.

Click Here to See the Answer

Q.6 Discuss as to how Condition Assessment Programme differs from Condition Assessment Scheme.
Click Here to See the Answer

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.
Click Here to See the Answer

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

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?
Click Here to See the Answer

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

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.
Click Here to See the Answer

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.
Click Here to See the Answer

Q.3 Transverse cross sectional areas of the ship from keel to the waterline measured from AP at 12m equal
intervals are as follows:
600m2, 800m2, 1200m2, 1400m2, 1400m2, 1200m2, 600m2, 300m2 and 50m2.
Forward of the forward most bulkhead is appendage whose volume is 160m3 and its centroid is 4m forward of the bulkhead.
Click Here to See the Answer

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

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).
Click Here to See the Answer

Q.6 Describe Condition Assessment Scheme (CAS) and explain its objectives and procedures.
Click Here to See the Answer

Q.7 Enumerate various types of surveys and draw a diagrammatic arrangement of various surveys as required by harmonized system of surveys and certification.
Click Here to See the Answer

Q.8 Describe the process of gas wielding, with the help of neat diagrams.
Click Here to See the Answer

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