B.Tech. Degree V Semester Regular Examination in Marine Engineering December 2021

19-208-0507 NAVAL ARCHITECTURE-1
(2019 Scheme)

Time: 3 Hours

Maximum Marks: 60

(5 × 15 = 75)

I. (a) With the help of a layout explain the characteristics of container ship. (7.5)

    (b) What are the classification of ship types based on operation aspect? (7.5)

OR

II. (a) Draw the general arrangement of a crude oil tanker and explain its characteristics. (8)

    (b) Explain the constructional features of a bulk carrier vessel. (7)

III. (a) Draw lines plan of a typical cargo ship and mark all the parameters. (7)

    (b) The TPC values for a ship at 1.2 m intervals of draught commencing at the keel are 8.2,16.5,18.7,19.4,20.0,20.5 and 21.1 respectively. Calculate the displacement at 7.2 m draught. (8)

OR

IV. (a) Derive expression for Simpson's first integration rule and also state its application. (5)

    (b) A ship of 6000 tonnes displacement is composed of masses of 300,1200 and 2000 tonne at a distance 60,35 and 11 m aft of midships, and masses of 1000,1000 and 500 tonne at a distance 15,30 and 50 m forward of midships. Calculate the distance of the centre of gravity of the ship from midship. (10)

V. (a) Draw statical stability curve and mark all the parameters, also explain IMO intact stability criteria. (6)

    (b) An inclining experiment was carried out on a ship of 8000 tonne displacement. A mass of 10 tonne was moved 14 m across the deck causing pendulum 8.5 m long to deflect 110 mm. The transverse metacenter was 7.15 m above the keel. Calculate the metacentric height and the height of centre of gravity above the keel. (9)

OR

VI. (a) Using suitable example explain the effect of tank division on free surface effect for: (8)
      (i)   with no division
      (ii) with a mid-length transverse division
      (iii) with longitudinal, centerline division.

    (b) The righting levers of a ship of 15,000 tonne displacement at angles of heel 15,30,45 and 60 degrees are 0.29,0.70,0.93 and 0.90 m respectively. Calculate dynamical stability of the ship at 30 and 60 degrees. (7)

(P.T.O.)

BT MRE–V(R)–12.21–1059

VII. (a) A ship 126 m long is floating at drafts of 5.5 m F and 6.5 m A. The centre of flotation is 3 m aft of amidships. MCT 1 cm = 240 tonnes m. Displacement = 6000 tonnes. Find the new drafts if a weight of 120 tonnes already on board is shifted forward a distance of 45 metres. (7.5)

(b) A ship 90 m long is floating at drafts 4.5 m F and 5.0 m A. The centre of flotation is 1.5 m aft of amidships. TPC 10 tonnes. MCT 1 cm. 120 tonnes m. Find the new drafts if a total weight of 450 tonnes is loaded in a position 14 m forward of amidships. (7.5)

OR

VIII. (a) A ship 100 m long arrives in port with drafts 3 m F and 4.3 m A. TPC 10 tonnes. MCT 1 cm 120 tonnes m. The centre of flotation is 3 m aft of amidships. If 80 tonnes of cargo is loaded in a position 24 m forward of amidships and 40 tonnes of cargo is discharged from 12 m aft of amidships, what are the new drafts? (7)

(b) A ship of 6000 tonnes displacement has drafts 7 m F and 8 m A. MCT 1 cm 100 tonnes m, TPC 20 tonnes, centre of flotation is amidships; 500 tonnes of cargo is discharged from each of the following four holds: (8)

(i) No. 1 hold, centre of gravity 40 m forward of amidships

(ii) No. 2 hold, centre of gravity 25 m forward of amidships

(iii) No. 3 hold, centre of gravity 20 m aft of amidships

(iv) No. 4 hold, centre of gravity 50 m aft of amidships.

The following bunkers are also loaded:

(i) 150 tonnes at 12 m forward of amidships

(ii) 50 tonnes at 15 m aft of amidships.

Find the new drafts forward and aft.

IX. (a) Sketch the propeller shaft, from the propeller to the main Engine. On the sketch, label the positions of the ship powers PE, PT, PD, PB, PS and PI and also explain various powering coefficients. (9)

(b) A Bulk Carrier has a displacement of 60144 tonnes, a service speed of 14.80 kt and a shaft power of 8738 kW. What is the service speed for a similar Bulk Carrier having a displacement of 62250 tonnes with a shaft power of 8450 kW? (6)

OR

X. (a) For a new vessel, the effective power is 3479 kW, delivered power is 4785 kW and the brake power is 5178 kW. Calculate the QPC and the PC. (6)

(b) A 7.55 m length ship model has a wetted surface area of 6.75 m^2. It is towed through fresh water at a speed of 3 kt. The total resistance is measured and found to be 34 N. Calculate the corresponding speed and the effective power for a ship having an LBP of 148 m operating in sea water. (9)

***