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10MR52

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015
NAVAL Architecture – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. The half breadth of the load water plane of a ship 150 m long commencing from aft are 0.3, 3.8, 6.0, 7.7, 8.3, 9.0, 8.4, 7.8, 6.9, 4.7 and 0 m respectively. Calculate :
i) Area of waterplane
ii) Distance of centriod from midship
iii) Second moment of area about a transverse axis through the centriod. **(12 Marks)**

b. A fore peak is 4.8 m deep and 5.5 m wide at the deck. At regular interval of 1.2 m below the deck, the horizontal widths are 5.0, 4.0, 2.5 and 0.5 m respectively. The bulkhead is flooded to top edge with seawater on one side only. Calculate :
i) Area of bulkhead
ii) Load on bulkhead
iii) Position of centre of pressure. **(08 Marks)**

2 a. A ship 135 m long, 18 m beam and 7.6 m drought has a displacement of 14000 tonne. The area of the load waterplane is 1925 m^2 and the area of the immersed mid-ship section 130 m^2. Calculate : i) C_W ii) C_M iii) C_B iv) C_P **(08 Marks)**

b. The length of the ship is 18 times the drought while the breadth is 2.1 times the draught. At the load waterplane, the waterplane area coefficient is 0.83 and difference between the TPC in sea water and TPC in fresh water is 0.7. Determine the length of the ship and TPC in fresh water. **(08 Marks)**

c. Define waterplane area coefficient and prismatic coefficient of forms with the help of neat sketch. **(04 Marks)**

3 a. An oil tanker of 17000 tonne displacement has its centre of gravity 1 m aft of midship and has 250 tonne of oil fuel in its forward deck tank 75 m from midship. The fuel is transferred to the after oil fuel bunker whose centre is 50 m midship. 200 tonne of fuel from after bunkers is now burned. Calculate the new position of centre of gravity.
i) After the oil has been transferred
ii) After the oil has been used. **(08 Marks)**

b. A ship of 4000 tonne displacement has its centre of gravity 1.5 m aft of midship and 4 m above the keel. 200 tonne of cargo are now added 45 m forward of midship and 12 m above the keel. Calculate the new position of centre of gravity. **(08 Marks)**

c. Write a note on effect of change in density of water with regard to ship's volume and displacement. **(04 Marks)**

4 a. Describe how an inclination experiment is carried out. A vessel of 8000 tonne displacement was inclined by moving 5 tonne through 12 m. The recorded deflections of a 6 m pendulum were 73, 80, 78 and 75 mm. If the KM for this displacement was 5.10 m calculate KG. **(10 Marks)**

b. A ship of 6000 tonne displacement has its centre of gravity 5.9 m above the keel and transverse metacentre 6.8 m above the keel. A rectangular double bottom tank 10.5 m long, 12 m wide and 1.2 m deep is now half filled with sea water. Calculate the meta centric height. **(10 Marks)**

PART – B

5 a. Define free surface effect and explain the effect of tank divisions on free surface considering the following cases :
   i) With no divisions
   ii) With mid – length, transverse division
   iii) With a longitudinal, centerline division. **(12 Marks)**

   b. A ship 7200 tonne displacement has KG 5.20 m, KB 3.12 m and KM 5.35 m. 360 tonne of fuel at kg 0.6 m are now used. Ignoring free surface effect and assuming the KM remains constant. Calculate the angle to which the vessel will keel. **(06 Marks)**

   c. Define "Angle of Loll" with the help of stability curve. **(02 Marks)**

6 a. A ship of 15000 tonne displacement, 96 m long, floats at draught of 5.60 m forward and 6.30 m aft. The TPC is 11.5, GM_L 105 m and centre of floatation 2.4 m aft of midship. Calculate :
   i) The MCT 1 cm.
   ii) The new end draughts when 88 tonne are added 31 m forward of midship. **(08 Marks)**

   b. A box barge 120 m long and 8 m beam floats at an iron keel draught of 3 m and has an empty compartment 6 m long at the extreme fore end. The centre of gravity is 2.8 m above the keel. Calculate the final draught if this compartment is bilged. **(08 Marks)**

   c. Define fresh water allowance and comment on change in mean drought due to change in density. **(04 Marks)**

7 a. Explain curve of floodable length and how floodable length of a ship is determined. **(08 Marks)**

   b. A vessel of constant rectangular cross – section is 60 m long and 10 m wide. It floats at a level keel drought of 3 m and has a centre of gravity 2.5 m above the keel. Determine the fore and aft draughts if an empty, full width, fore end comportment 8 m long is opened to the sea. (Use lost buoyancy and added weight method for calculation.). Assuming permeability as 100%. **(12 Marks)**

8 a. A ship of 12000 tonne displacement travels at a speed of 14.5 knots when developing 3500 KW shaft power. Calculate :
   i) The value of the admiralty coefficient
   ii) The percentage increase in shaft power required to increase the speed by 1.5 knots
   iii) The percentage increase in the speed of the ship if the shaft power is increased to 4000 KW. **(10 Marks)**

   b. The daily fuel consumption of a ship at 15 knots is 40 tonne. 1100 nautical miles from port it is found that the bunkers are reduced to 115 tonne. If the ship reaches port with 20 tonne of fuel onboard. Calculate the reduced speed and the time in hours to complete the voyage. **(07 Marks)**

   c. Define frictional resistance (R_f) and list the various factors on which frictional resistance of a ship depends. **(03 Marks)**

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