INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

END SEMESTER EXAMINATIONS –JUNE/JULY 2019

B.Tech. (MARINE ENGINEERING)

Semester – VI

Naval Architecture - II

(UG11T1605 / UG11T2605)

Time: 3 Hours | Max Marks: 100

Date: 03.07.2019 | Pass Marks: 50

PART – A Marks:10 X 3=30

(All questions are compulsory)

Write Short and to the point answers to the following questions.

1.

a) Draw and label rake angle and skew angle in marine propeller?

b) Why and where are Kort nozzles used?

c) What is pitch of a propeller?

d) Differentiate between Taylor wake factor and Froude wake factor.

e) Why the maximum Rudder angle is limited to 35^0? Explain

f) Why are rudders fitted at the aft of the vessels?

g) What do you understand by sagging and hogging of a ship?

h) What is the importance of calculating section modulus for a ship?

i) Why antirolling devices used in ship? Draw a schematic diagram of four antirolling devices.

j) Draw a figure of ship and label 6 degrees of freedom.

PART – B Marks: 5 X 14=70

(Answer any 5 of the following)

2.

a) A ship of 12400 tonne displacement is 120 m long, 17.5 m beam and floats at a draught of 7.5 m. The propeller has a face pitch ratio of 0.75 and, when turning at 100 rev/min, produces a ship speed of 12 knots with a real slip of 30%. Calculate the apparent slip, pitch and diameter of the propeller. The wake fraction ω may be found from the expression:

$$\omega = 0.5\ C_b - 0.05$$

[7]

b) How cavitation occur in marine propeller? What are the effects on performance of propeller and how to prevent the cavitation?

[7]

3. A propeller has a pitch ratio of 0.95.When turning at 120 rpm the real slip is found to be 30%, the wake fraction is 0.28 and the ship is having a speed of 16 knots. The thrust is found to be 400 kN, the torque 270 kN-m and the QPC 0.67. Calculate:
   i) The propeller diameter
   ii) The shaft power
   iii) The propeller efficiency
   iv) The thrust deduction factor.

[14]

4.
   a) Derive expressions for angle of heel, when ship is making steady turn.

[7]

   b) A vessel travelling at 17 knots turns with a radius of 450 m when the rudder is put hard over to starboard. The centre of gravity is 7 m above the keel, the transverse metacentre 7.45 m above the keel and the centre of buoyancy 4 m above the keel. Calculate the angle of heel when turning. The rudder force may be ignored.

[7]

5.
   a) The service speed of a ship is 14 knots and the rudder with an area of 13 sq. Meter, has its centre of effort 1.1 meter from the rudder stock. Calculate the torque on the stock at 10 deg. Interval of rudder angle upto 40 deg. And estimate the work done in turning the rudder from centerline up to 40 degs. Assume the rudder force parallel to the streamline is equal to 580 Av^2 Newton,
   (i.e. F= 580 x area of the rudder in sq. metre x square of the speed of the ship in m/s).

[7]

   b) Draw a neat sketch of the path of a ship, when executing a turn under the action of the rudder, being put hard over to one side. Label the diagram showing the following:-
   i) Advance; ii) Transfer; iii) Tactical Diameter.

[7]

6. A steel barge, shown in Fig. 1 of constant rectangular section, length 72m, floats at a draught of 5 m when loaded. The weight curve of the loaded barge may be regarded as linear, from zero at the two ends to a maximum at the mid-length. The structural section is shown below. If the stress in the deck in still fresh water is not exceeding 123 MPa, estimate the thickness of the plating if this is assumed to be constant throughout.

[14]

7. A box-shaped barge of uniform construction is 32 m long and displaces 352 tonnes when empty, is divided by transverse bulkheads into four equal compartments.
   Cargo is loaded into each compartment and level stowed as follows:
   No. 1 hold – 192 tonnes No. 2 hold – 224 tonnes
   No. 3 hold – 272 tonnes No. 4 hold – 176 tonnes
   Construct load and shearing force diagrams, before calculating the bending moments at the bulkheads and at the position of maximum value; hence draw the bending moment diagram.

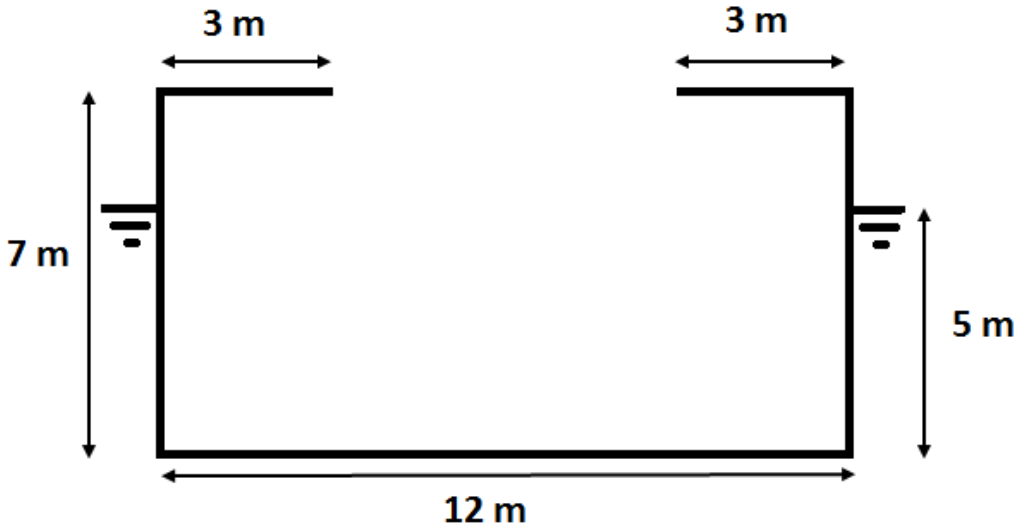
[14]

8.
   a) Explain the wave energy spectrum and state its significance.

[7]

   b) A ship of length 135 m has a displacement of 12,500 tons and radius of gyration about the longitudinal axis of 9.24 m. The transverse metacentric height is 1.74 m. Find the natural period of roll by taking the added mass to be 20% of the actual mass of the ship.

[7]



(Fig.1)

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