

INDIAN MARITIME UNIVERSITY
(A Central University, Govt. of India)

B.Tech. (Marine Engineering) - Semester VI
December 2015 End Semester Examinations

Naval Architecture - II
Subject Code: UG11T1605

Time: 3 hrs
Date: 22.12.2015

Max Marks: 100
Pass Marks: 50

Part-A

(10x 3 =30 Marks)

Compulsory Question

1. Answer all the parts of the following:-
 - a) With respect to ship movement in waves, what is meant by Head Sea, Following Sea and Beam Sea.
 - b) State the difference amongst a Balanced , an Unbalanced & a Semi-balanced Rudder.
 - c) What is meant by Apparent Slip of a Propeller & Why it can have a negative value.
 - d) For the purpose of investigating the Longitudinal bending of a ship, state the generalised assumptions made.
 - e) What are the parameters on which the Time Period of Heaving of a ship depend upon?
 - f) In a twin screw ship, the two propellers rotate in opposite directions. State the significance of the same.
 - g) State reasons for fitting the Rudder of a Ship at the Aft End.
 - h) Distinguish between “ Augment of Resistance “ & Thrust Deduction Factor”
 - i) With respect to sea waves , what is meant by “Energy Spectrum”?
 - j) With respect to propeller performance, what is meant by “Relative Rotative Efficiency”
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Part --B

(5 X 14 =70 Marks)

Answer any Five of the following (All questions carry equal marks)

2. Test with a model propeller in the open water gives the values of K_T , K_Q , which may be taken as straight lines between the following points, on a base of J are as follows:-

J	K_T	K_Q
0	0.28	0.025
0.7	0.0	0.004.

Plot the curve of Open Water Efficiency for the propeller on a base of J and find the maximum efficiency.

3. The service speed of a ship is 14 knots and the rudder with an area of 13 sq. Metre, has its centre of effort 1.1 metre 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 centreline up to 40 degs. Assume the rudder force parallel to the streamline is equal to $580 A v^2$ Newton, (i.e. $F=580 \times \text{area of the rudder in sq.metre} \times \text{square of the speed of the ship in m/s}$).

4. (a) Derive an expression for the natural period of rolling of a ship in terms of polar radius of gyration(K_T) and the metacentric height(GM).
- (b) A ship has the following particulars, i) Length-97.5 metres; ii) Transverse metacentric Height =0.76m; iii) Longitudinal metacentric height =110m; iv) Transverse radius of gyration @ Long. Axis =3.65 m (KT); (v) Longitudinal radius of gyration @ transverse axis = 24.4 m(KL).
- Find the natural periods of Rolling & Pitching.
- 5) When a propeller of 4.8 meter pitch turns at 110 rpm, the apparent slip is found to be --S% and the real slip +1.5S%. If the wake speed is 25% of ship's speed, calculate the ship's speed, apparent slip and the real slip.
- 6) (a) State the factors that influence the magnitude of force developed by the rudder for turning the ship in water.
- (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) Write short notes on the following:-
- a) Cavitations phenomenon in a Ship's propeller.
- b) Zigzag manoeuvring test on a ship's rudder.
- 8) The ordinates of the curve of buoyancy for the forward body of a ship at stations of 10.7 metres apart commencing from the forward perpendicular are:- 0, 21.7, 48.3, 81.0, 113.0, 136.5, and 143.0 tonnes per metre of the length of the ship. The weight distribution throughout the forward body is uniformly at the rate of 73.0 tonnes per metre. Draw the curves of Load, and Shearing Force.
