

**INDIAN MARITIME UNIVERSITY**  
(A Central University, Government of India)  
**END SEMESTER EXAMINATIONS- DECEMBER 2018**  
Post Graduate Diploma in Marine Engineering (PGDME)  
**Semester: II**  
**NAVAL ARCHITECTURE\_ (PD11T3204)**

**Date: 18-12-2018**

**Max Marks: 100**

**Time: 3Hrs**

**Pass Marks: 50**

**PART - A**

Q. 1 **Compulsory** - Short answer questions :

(a) Define the following terms – (5x2=10 Marks)

- (i) Trochoidal wave.
- (ii) Propeller cavitation.
- (iii) Section modulus.
- (iv) Admiralty coefficient.
- (v) Six degrees of ship motion.

(b) What are the factors affecting frictional resistance of ship? (5 Marks)

(c) What is specific fuel consumption? How it varies with speed? (5 Marks)

(d) What are various anti rolling devices used on ships? (5 Marks)

(e) What is free surface effect and how it can be reduced? (5 Marks)

**PART - B**

**Answer any five out of the following eight questions.**

(5x14=70 Marks)

Q.2 (a) What is statical stability curve? How can you find metacentric height from it? (7 Marks)

(b) What is the difference between list and loll? What actions are required to correct loll? (7 Marks)

Q. 3 A box-shaped vessel floats upright on an even keel in fresh water of density 1000 kg per cu. m, and the centre of buoyancy is 0.50 m above the keel. Find the height of the centre of buoyancy above the keel when the vessel is floating in salt water of density 1025 kg per cubic metre. (14 Marks)

Q. 4 (a) Draw typical curves of buoyancy, weight, load, shearing force and bending moments for a ship. (10 Marks)

(b) List the structural members of a ship which are designed to resist the main longitudinal stresses in a ship's hull. (4 Marks)

Q.5 The areas of equidistantly spaced vertical sections of a vessel's underwater form 400 metres long and starting from forward are as follows:

30, 226.4, 487.8, 731.6, 883.0, 825.5, 587.2, 262.1 and 39.8 sq. m.

Calculate her displacement in salt water and the longitudinal centre of buoyancy. (14 Marks)

Q.6 A ship 100 m in length floats at draughts forward 7.00 m and aft 6.80 m. Calculate the final draughts if 150 tonnes is loaded 20 m forward of aft perpendicular given that TPC is 15 and MCTC is 150 tm and LCF is 45 m forward of aft perpendicular. (14 Marks)

Q.7 (a) What is Froude's law of comparison? How is it used to find total resistance of ship? (7 Marks)

(b) The residuary resistance of a model 7 m long is 20 N when towed at 3.5 knots. Calculate the power required to overcome the residuary resistance of a similar ship 140 m long at its corresponding speed. (7 Marks)

Q.8 A rudder has an area of 15 m<sup>2</sup> with its centre of effort 0.9 m from the centre of stock. The maximum rudder angle is 35° and it is designed for a service speed of 15 knots. Calculate the diameter of the rudder stock if the maximum allowable stress is 55MN/m<sup>2</sup> and the rudder force is given by :  $F = 580 A V^2$  Newtons with V in m/s. (14 Marks)

Q. 9 (a) What is propeller pitch? (4 Marks)

(b) A propeller of 4.5 m pitch turns at 120 rpm and drives the ship at 15.5 knots. If the wake fraction is 0.30, calculate the apparent slip and the real slip. (10 Marks)

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