UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: July 2022

Module Number: MN3201   **Module Name: Fundamentals of Naval Architecture**

[Three Hours]

[Answer all questions]

Draw neat sketches as applicable

Q1. (a) State Archimedes Principle and Laws of Floatation.

[4 Marks]

(b) Describe the states of equilibrium.

[6 Marks]

(c) What is Trim? Explain in brief.

[2 Marks]

(d) A ship 130 m long displaces 12000 ton. When a mass of 100 ton is moved 75 m from forward to aft there is a change in trim of 65 cm by stern. Find the followings;

(i)   MCT 1 cm
(ii)   The Longitudinal Metacentric Height

[6 Marks]

(e) Explain the importance of Hydrostatic Curve.

[2 Marks]

Q2. (a) Explain the effect of shifting weights horizontally and vertically on ships stability.

[2 Marks]

(b) What is a Lines Plan and describe Profile view, Half Breadth Plan and Body Plan

[8 Marks]

(c)   Briefly explain the following;

      (i)   Off Set Table

      (ii)   Ordinates (Stations)

      (iii)   Buttock Lines

      (iv)   Water Lines

[4 Marks]

(d)   What is the importance of Sea Keeping?

[2 Marks]

(e)   With the help of a sketch describe Ships Motions.

[4 Marks]

Q3.   (a)   What measures are adopted to reduce Free Surface Effect during construction of vessels?

[2 Marks]

(b)   A ship of 5000 ton displacement has a rectangular double bottom tank 8 m wide and 12 m long and half full of sea water. Calculate the virtual reduction in metacentric height due to free surface.

[4 Marks]

(c)   Write short notes on followings;

      (i)   Heel and List

      (ii)   LBP, LOA

      (iii)   Moulded Breadth, Breadth Maximum

      (iv)   Camber, Sheer

[8 Marks]

(d)   Explain the longitudinal bending moments casing stresses/strains experienced by a ship at sea.

[2 Marks]

(e)   Explain various stages of design and production of ships.

[4 Marks]

Q4. (a) Explain following Stability information

      (i) The Range of Stability

      (ii) The Angle of Vanishing Stability

      (iii) Maximum GZ

      (iv) Initial Metacentric Height.

[6 Marks]

(b) Indicate the conditions to be maintained during an Inclining Experiment.

[4 Marks]

(c) A mass of 6 ton is moved transversely through a distance of 14 m on a ship of 4300 ton displacement, when the deflection of an 11 m pendulum is found to be 120 mm. The transverse metacenter is 7.25 m above the keel. Determine the height of center of gravity above the keel.

[4 Marks]

(d) How the "Water Tight Bulkhead" does contribute on ships' stability?

[2 Marks]

(e) List out the ways how to control and prevent Marine Pollution.

[4 Marks]

Q5. (a) Define the term "Ton Per Centimeter Immersion"

[3 Marks]

(b) The TPC values for a ship at 0.9 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 5.4 m draught.

[6 Marks]

(c) State the types of Resistance on ships.

[4 Marks]

(d) List out factors on which the Frictional Resistance (viscous resistance) of a ship depends upon.

[4 Marks]

(e) Briefly explain the function of Bulbous Bow.

[3 Marks]