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

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

Strength of Materials - II
Subject Code: UG11T2304/ UG11T1304

Time: 3 hrs | Max Marks: 100
Date: 18.12.2015 | Pass Marks: 50

Part-A (3 x 10 = 30 Marks)

Compulsory Questions

1. a) What do you mean by principal plane?
   b) What do you understand by the term 'Point of contraflexure'?
   c) A rod of diameter 30 mm and length 400 mm was found to elongate 0.35 mm when it was subjected to a load of 65 kN. Compute the modulus of elasticity of the material of this rod.
   d) List any four methods of determining slope and deflection of loaded beam.
   e) What is Claperyon's three moment theorem?
   f) State Castigliano's theorem.
   g) What are assumptions involved in the analysis of thin cylindrical shells.
   h) The actual length of a column is 10 m. Determine its effective length if both the ends of the column are rigidity fixed.
   i) Write the difference between built-in and continuous beams
   j) Define bulk modulus.

Part-B (5 x 14 = 70 Marks)

Answer any five of the followings.

2. At a point in a strained material, the principle stress are $100N/mm^2$ tensile and $40N/mm^2$ compressive. Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major principle stress. What is the maximum intensity of shear force in the material at the point? (11+3=14)

3. The tensile stresses at a point across two mutually perpendicular planes are $120N/mm^2$ and $60N/mm^2$. Determine the normal, tangential and resultant stress on a plane inclined at 30° to the axis of the major stress. Use Graphical Method (Mohr's circle method) (14)

4. a) A beam AB of length, simply supported at ends A and B carries a point load at the centre. Determine maximum slope and maximum deflection by moment area method.
   b) A beam 4 meter long, simply supported at its ends, and carries a point load W at its centre. If the slope at the ends of the beam is not to exceed 1°, find the deflection at the centre of the beam. (7+7)

5. Obtain expression for the maximum bending moment and deflection of a beam of length L and flexural rigidity EI, fixed horizontally at both end (built in) carrying a point load at centre. (14)

6. a) A cantilever beam AB of length L and carrying a uniformly distributed load. Find the expression for maximum slope and maximum deflection for the beam (any method).

   b) A cantilever of length 3 m is carrying a point load of 50 kN at a distance of 2 m from the fixed end. If $I=10^8 mm^4$ and $E=2\times10^5\ N/mm^2$, find (i) slope at the free end and (ii) deflection at the free end. (7+7 = 14)

7. Find the thickness of metal necessary for a cylinder shell of internal diameter 160 mm to withstand an internal pressure of $8\ N/mm^2$. The maximum hoop stress in the section is not to exceed $35\ N/mm^2$. (14)

8. a) Explain the limitation of Euler's formula.
   b) A solid round bar 3 m long and 5 cm in diameter is used as a strut with both ends hinged. Determine the crippling (or collapsing) load. Take $E = 2.0 \times 10^5\ N/mm^2$. (5+9=14)