

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

**May/June 2015 End Semester Examinations**

**SEMESTER – III, B.TECH ( MARINE ENGINEERING)**

**STRENGTH OF MATERIALS - II (T 2304 / T 1304)**

**Date: 17.06.2015**  
**Time: -3 Hrs**

**Max. Marks: 100**  
**Pass Marks: 50**

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**PART – A**  
**(Compulsory Questions)**

**(3 x 10 = 30 Marks)**

1. a) How can you determine principal strains.
- b) Explain the method of drawing Mohr's Stress Circle .
- c) Deduce the expression for the strain energy due to bending.
- d) How can you find the deflection by integration ?
- e) How built-in and continuous beams can be differentiated ?
- f) What is Clapeyron's three moment theorem ?
- g) State Castigliano's Theorem.
- h) How is strain energy due to twisting can be measured ?
- i) Define compound cylinder cylinders.
- j) State and explain Euler's theory for struts.

**PART – B**  
**(Answer any five of the following)**

**(5 x 14 = 70 Marks)**

2. At a section in a beam the tensile stress due to bending is  $50 \text{ N/mm}^2$  and there is a shear stress of  $20 \text{ N/mm}^2$ . Determine from first principle the magnitude and direction of the principal stresses and calculate the maximum shear stress.

**(14)**

3. How much load can be safely applied at the free end of a cantilever 3 m long, if beam section is rectangular 20mmX60mm and maximum stress does not exceed 80 MPa,  $E=200$  GPa.

What are the slope and deflection at the free end of the cantilever? **(14)**

4. A beam ABCD, 12m long supported over AC=10m, carries concentrated loads of 40 kN at the end D where AD =12m. Determine the slope at D and deflection at B. Given EI is the flexural rigidity of the beam. Apply MACAULAY'S method.

**(14)**

5. a) Explain the procedure of finding slope and deflection of a beam by Moment –Area Method.

b) A beam AB of length L, simply supported at ends A and B carries a udl of intensity w throughout its length. Determine slope at A by moment area method.

**(8+6)**

6. If a length  $\delta s$  of an initially curved beam is acted upon by a bending moment M, find out the expressions for the horizontal and vertical deflections. **(14)**

7. A thick steel cylinder having an internal diameter of 150 mm and an external diameter of 200 mm is subjected to external pressure of  $8 \text{ N/mm}^2$ . Hoop stress at the inner radius is  $40 \text{ N/mm}^2$ . What is the amount of internal pressure ? **(14)**

8. a) Explain Rankine-Gordan formula.

b) A straight bar of alloy, 1m long and 12.5 mm by 4.8mm in section is mounted in a strut-testing machine and loaded axially until it buckles. Apply Euler formula to estimate the maximum central deflection before the material attains its yield point of  $280 \text{ N/mm}^2$ .  $E=72000 \text{ N/mm}^2$ .

**(4+10)**

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