

INDIAN MARITIME UNIVERSITY
Time Bound Assignment
B Tech (ME) Arrear Examinations
September/October 2020
UG11T3304
Strength of Materials - II

Date: 15/09/2020
Duration: 3 Hrs

Max Marks: 70
Pass Marks: 35

Part – A (compulsory)
Answer the following (10x2=20 Marks)

- 1 Define principal planes and principal stress.
- 2 What is Mohr's Circle?
- 3 State the assumption made in Macaulay's method to find slopes and deflection of a beam.
- 4 State the assumption made in Lamé's theory.
- 5 Write down the Applications of Clapeyron's Theorem of Three Moments Number.
- 6 What are the assumptions made in the Euler's Column Theory?
- 7 Write down the Methods for Slope and Deflection at a Section
- 8 Define crushing load and crippling load.
- 9 What is meant by hoop stress?
- 10 What is the crippling load for columns obtained by Rankine's formula?

Part – B

Answer any 5 out of 7 questions (5 x 10= 50 marks)

- 11 The stresses at point of a machine component are 150 MPa and 50 MPa both tensile. Find the intensities of normal, shear and resultant stresses on a plane inclined at an angle of 55° with the axis of major tensile stress. Also find the magnitude of the maximum shear stress in the component. **(10 Marks)**
- 12 A plane element in a body is subjected to a tensile stress of 100 MPa accompanied by a clockwise shear stress of 25 MPa. Find (i) the normal and shear stress on a plane inclined at an angle of 20° with the tensile stress; and (ii) the maximum shear stress on the plane. **(10 Marks)**
- 13 A simply supported beam AB of span 5 metres is carrying a point load of 30 kN at a distance 3.75 m from the left end A. Calculate the slopes at A and B and deflection under the load. Take $EI = 26 \times 10^{12}$ N-mm². **(10 Marks)**

- 14 A cantilever beam of length 3 m is carrying a uniformly distributed load of w kN/m. Assuming rectangular cross-section with depth (d) equal to twice the width (b), determine the dimensions of the beam, so that vertical deflection at the free end does not exceed 8 mm. Take maximum bending stress = 100 MPa and $E = 200$ GPa. **(10 Marks)**
- 15 A hollow alloy tube 4 m long with external and internal diameters of 40 mm and 25 mm respectively was found to extend 4.8 mm under a tensile load of 60 kN. Find the buckling load for the tube with both ends pinned. Also find the safe load on the tube, taking a factor of safety as 5. **(10 Marks)**
- 16 A steel tube 240 mm external diameter is to be shrunk on another steel tube of 80 mm internal diameter. After shrinking, the diameter at the junction is 160 mm. Before shrinking on, the difference of diameter at the junction was 0.08 mm. Calculate the radial pressure at the junction and hoop stresses developed in the two tubes after shrinking on. Take E as 200 kN/mm² **(10 Marks)**
- 17 Find the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the column as 2.3 m and hinged at its both ends. Take $E = 205$ GPa. Also determine crippling load by Rankine's formula using constants as 335 MPa and $\frac{1}{7500}$ **(10 Marks)**

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