Hall Ticket No | | | | | | | | | | | Question Paper Code: AAE002

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech III Semester End Examinations (Supplementary) - January/February, 2018

Regulation: IARE – R16

THEORY OF STRUCTURES

(Aeronautical Engineering)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Define stress and strain? Derive the relation between elastic constant, E, K, and V. **[7M]**

   (b) A composite rod is 1000 mm long, its two ends are 40 mm2 and 30 mm^2 in area and length are 300 mm and 200 mm respectively. The middle portion of the rod is 20 mm^2 in area and 500 mm long. If the rod is subjected to an axial tensile load of 1000 N, find its total elongation. (E = 200 GPa). **[7M]**

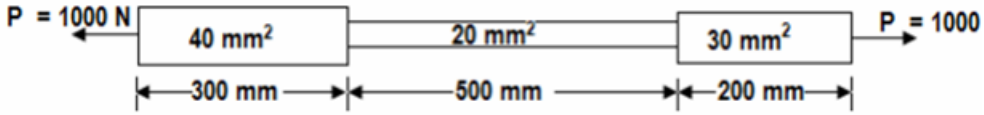

Figure 1

2. (a) Define torsional rigidity? In a tensile test, a test piece 25mm in diameter, 200 mm gauge length stretched 0.0975 mm under a pull of 50 kN. Then, the same rod is twisted 0.025 radians over a length of 200 mm, when a torque of 400Nm was applied. Find modulus of rigidity? **[7M]**

   (b) A cantilever beam 1.5 m long is loaded with UDL of 2 kN/m over a length of 1.25 m from free end. It also carries point load of 3 kN at a distance of 0.25 m from free end. Draw SFD and BMD for the cantilever beam. **[7M]**

UNIT – II

3. (a) Write short notes on section modulus? Derive section modulus for hollow rectangular section solid rectangular section? **[7M]**

   (b) A rolled steel joist of I-section has the dimensions as shown in figure 2. This beam of I-section carries UDL of 40 kN/m over a span of 10 m, calculate the maximum stress produced due to bending. **[7M]**

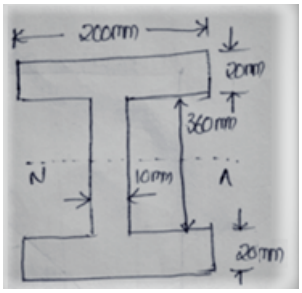

Figure 2

4. (a) Show that for a circular cross section, the maximum shear stress is equal to 4/3 times the average shear stress. **[7M]**

   (b) An I-section beam 350 mm x 150 mm has web thickness of 10 mm and flange thickness of 20 mm. If shear force acting on the section is 40 kN, find the maximum shear stress developed in the section. **[7M]**

UNIT – III

5. (a) Derive maximum deflection of a simply supported beam with point load at center using conjugate beam method. **[7M]**

   (b) A cantilever beam of length 2m carries a UDL of 2.5 kN/m for length of 1.25 m from fixed end and a point load 1 kN at free end. Find deflection at free end, if the section is solid rectangular with 12 cm wide and 24 cm deep. Take E = 10 GPa. **[7M]**

6. (a) Derive the expression for crippling load when one end of the column is fixed and the other end is free. **[7M]**

   (b) Write the limitations of Euler's formula and explain with an example of mild steel column. **[7M]**

UNIT – IV

7. (a) Briefly explain about moment area method and differentiate between frames and trusses. **[7M]**

   (b) Determine the forces in all the members of a cantilever truss shown in figure 3. **[7M]**

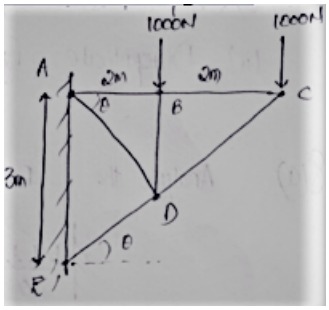

Figure 3

8. (a) What is a Frame? State the difference between perfect frame and an imperfect frame. **[7M]**

   (b) Explain Clapeyron's method for statically indeterminate structures. **[7M]**

UNIT – V

9. (a) Define the terms Principal planes, Principal stress and angle of obliquity. **[7M]**

   (b) Write a note on Mohr's circle of stresses and write its applications. **[7M]**

10. (a) The tensile stresses at a point across two mutually perpendicular planes are 120 MPa and 60 MPa. Determine normal, tangential and resultant stresses on plane inclined at 30° to the axis of minor stress. **[7M]**

    (b) A point in a strained material is subjected to stresses shown in figure 4. Using Mohr's circle method, determine normal and tangential stresses across oblique plane. **[7M]**

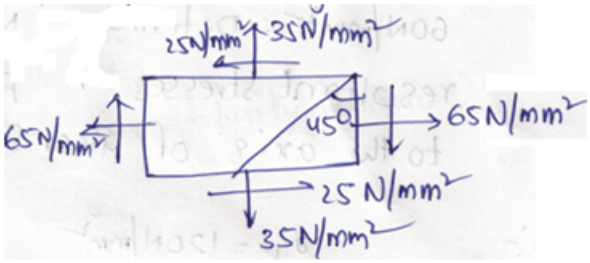

Figure 4

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