This question paper contains 3 printed pages.]

Your Roll No. .....

8457 **A**

B.Tech. (M)/II

Paper EME–206—STRENGTH OF MATERIALS

Time : 3 *Hours* *Maximum Marks* : 70

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer ***five*** *questions in all, selecting at least* ***two*** *from Part A and* ***two*** *from Part B.*

Assume missing data, if any.

PART-A

1. (a) Define Principal Stress 2

(b) A plane element is subjected to stresses in X-Y Plane as follows :

σ_x = 40 MPa (Compression)

σ_y = 80 MPa (Tension)

and τ_{xy} = 60 MPa (Clockwise)

Determine the stresses at a plane having its normal at 45° to the horizontal. Also determine principal stresses and maximum shear stress. 12

[P.T.O.

2. (a) State Castiglianor Theorem. 2

(b) A simply supported beam is subjected to UDL over its entire span.

Determine total strain energy stored in the beam using Castiglianor Theorem. 12

3. (a) Explain any ***five*** theories of failure 10

(b) Prove that $\frac{\sigma_{x\,max} - \sigma_{x\,min}}{2} = \tau_{x\,max}$ 4

4. (a) Derive the expressions for loop stress and longitudinal stress in a thin cylinder when it is subjected to internal pressure. 8

(b) A compressed air cylinder of internal diameter of 600 mm has a wall thickness of 3 mm. It contains air at a pressure of 1.5 MPa. Calculate the stresses in the cylinder walls. Also determine the shear stress in the cylinder. 6

PART–B

5. Derive the expression for

(a) Strong Energy

(b) axial deflection

(c) axial rotation

(d) Principal stresses

in an open coiled helical spring subjected to both axial load and couple 14

6. A fixed beam is subjected to gradually varying load over entire length of its span. Derive the expression for

   (i) Shear force

   (ii) bending moment

   (iii) deflection

   (iv) slope.

   Draw SFD, BMD, dilution diagram and slope diagram. 14

7. (a) Derive the expression for "Flexure formula" for a curved beam of small radius of curvature subjected to bending. 9

   (b) Explain Mohr's stress circle diagram. 5

8. Write short notes on :

   (a) Ramkine-Gordon Formula

   (b) Stresses in crane hook

   (c) Fatigue behaviour of materials

   (d) Rotational stresses in rotating rings and discs 14