# 2008-PUNJAB TECHNICAL UNIVERSITY

**B.TECH I SEMESTER REGULAR EXAMINATION**

**MECHANIC OF SOLIDS**

**(ELECTRICAL AND ELECTRONICS ENGINEERING)**

**TIME-3HOUR**
**MARKS-80**

**ANSWER ANY FIVE QUESTIONS ALL QUESTIONS CARRY EQUAL MARKS**

1. A solid conical bar tapers uniformly from a diameter of 6cm to 2cm in a length of 100 cm. It is suspended vertically at the 6cm diameter, the 2 cm diameter end being downward. Calculate the elongation of the bar due to self-weight. Take unit weight of the bar material as 78.5 kN/m3 and E = 204 kN/mm2. [16]

2. A horizontal beam of 10m long is carrying a uniformly distributed load of 1 kN/m over the entire length. The beam is simply supported on two supports 6m apart. Find the position of the supports, so that the BM on the beam is as small as possible. Also draw the SF and BM diagrams. [16]

3. (a) State the assumptions involved in the theory of simple bending. [6]

(b) Derive the Bending equation from fist principle. [10]

4. (a) Obtain from first principles the expression for maximum shear stress in a triangular section of a beam. Sketch the variation of shear stress. [8]

(b) A beam of I-section is having overall depth as 600mm and overall width as 200mm. The thickness of flanges is 25mm where as the thickness of the web is 20mm. If the section carries a shear force of 55kN, calculate shear stress at salient points and sketch the shear stress distribution across the section. [8]

5. Figure 5 shows a truss ABCDEF, hinged at F and roller supported at D. It carries vertical loads of 30 kN at A and 20 kN at C. Determine reactions at supports and forces in all the members by method of joints [16]

6. (a) A girder of uniform section and constant depth is freely supported over a span of 2.5 meters. Calculate the central deflection and slopes at the ends of the beam under a central load of 25 kN. Given: I XX = 7.807 × 10-6m4 and E = 200 GN/m2 . [8]

(b) A simply supported 6 meters long rolled steel joist carries a uniformly dis- tributed load of 9.5 kN/meter length. Determine slope and deflection at a distance of 3 meters from one end of the beam. [8]

7. A vertical steam boiler is of 2 m internal diameter and 5 m high. It is constructed with 20 mm thick plates for a working pressure of 1 N/mm2. The end plates are flat and are not stayed. Calculate

(a) the stress in the circumferential plates due to resisting the bursting effect and the stress in the circumferential plate due to the pressure on the end plates. [8]

(b) the increase in length, diameter and volume. Assume the Poisson's ratio as 0.3 and E = 200 GN/m2. [8]

8. Compare the values of max. and minimum hoop stresses for a cast steel cylindrical shell of 600 mm external dia. And 400 mm internal dia. Subjected to a pressure of 30N/mm2 applied [16]
(a) Internally and
(b) Externally.