

**II B.Tech II Semester Supplementary Examinations, April/May 2005**  
**MECHANICS OF SOLIDS**  
**( Common to Mechanical Engineering, Mechatronics and Production Engineering)**

**Time: 3 hours****Max Marks: 70**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Explain the following terms:
  - i. Modulus of elasticity
  - ii. Modulus of rigidityDerive the relation between them.
- (b) A cast iron column has internal diameter of 200 mm. What should be the minimum external diameter so that it may carry a load of 1500 kN without the stress exceeding  $90\text{ N/mm}^2$ .
2. (a) What are the various types of beams?
- (b) A simply supported beam of 10 m span carries point loads of 5, 3, 4 kN at distances of 3, 6, 8 m from the first end Draw shear force and bending moment diagrams for the beam.
3. (a) A T-section of a beam has the following dimensions: width of flange = 100 mm overall depth = 75 mm Thickness of stem and flange = 10mm Determine the maximum stress in the beam when a bending moment of 250 N-m is acting on the section.
- (b) State the assumptions made in the theory of simple bending.
4. A beam of inverted T-section with 60mm90mm flange and 60mm20mm web is subjected to a shear force of 13.6 kN at a particular section. Obtain the value of maximum bending moment and draw the shear distribution diagram across the depth of the section.
5. (a) What is the relation between slope, deflection and radius of curvature of a simply supported beam?
- (b) A simply supported beam of 20m span carries two point loads of 4kN and 10kN at 8m and 12m from left end. Determine the deflection under each load. Take  $EI$  as  $200\text{ MNm}^2$ .
6. A hollow shaft of diameter ratio  $3/5$  is to transmit 600 kW at 100 rpm the maximum torque being 12% greater than the mean. If the shear stress is not to exceed  $60\text{ N/mm}^2$  and twist in a length of 3m not to exceed  $1^\circ$ , determine the minimum diameter satisfying these conditions. Take  $C=80\text{ kN/mm}^2$ .
7. (a) Distinguish between thin cylinders and thick cylinders.

- (b) A cylindrical shell 2 meters long and 1 meter internal diameter is 20 mm thick. Find the circumferential and longitudinal stress, when it is subjected to an internal pressure of  $10 \text{ N/mm}^2$ .

8. Write short notes on any THREE of the following:

- (a) Principal stresses and strains
- (b) Importance of factor of safety
- (c) Theories of failure
- (d) Hooke's law

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