M. Tech. Mechanical Engineering Design (CBCS) Semester-I

MED12 - Advanced Mechanics of Solids

P. Pages : 1 **GUG/S/25/14187**

Time : Three Hours * 2 4 8 1 * Max. Marks : 70

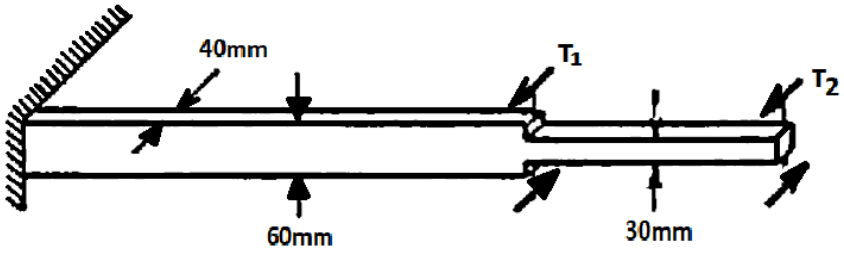
Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Solve **any five** questions.
6. Use of non-programmable calculator is permitted.

1. Derive the equation for bending stresses in beams subjected to nonsymmetrical bending. **14**

2. Derive the equation for linear elastic solution for rectangular cross section and equilateral triangle cross section. **14**

3. a) Define shear center in bending symmetrical and nonsymmetrical bending. **4**

b) The rectangular section torsion member as shown in figure has a width of 40 mm. The first 3 m length of the torsion member has a depth of 60 mm, and the remaining 1.5 m length has a depth of 30 mm. The torsion member is made of steel for which G = 77.5 GPa. For T_1 = 750 N-m and T_2 = 400 N-m, determine the maximum shear stress in the torsion member. Determine the angle of twist of the free end. The support at the left end prevents rotation of this cross section but does not prevent warping. **10**



4. Describe with the suitable example the method of computing principal stresses and maximum shear stresses. **14**

5. Derive the Stress-Strain-temperature relations for isotropic elastic plates. **14**

6. Derive the equations for stress resultants in a flat plate. **14**

7. Discuss in detail method of computing contact stresses. **14**

8. A feed roll (a device used to surface-finish steel shafts) consists of two circular cylinder steel rollers, each 200 mm in diameter and arranged so that their longitudinal axes are parallel. A cylindrical steel shaft 60 mm in diameter is fed between the rollers in such a manner that its longitudinal axis is perpendicular to that of the rollers. The total load P between the shaft and rollers is 4.5 kN. Determine the values of the maximum principle stress and maximum shear stress in the shaft. Determine the distance from the plane of contact to the point of maximum shear stress, E = 200 GPa and $\nu = 0.29$. **14**

****