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BME-017

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

BTCLEVI/BTMEVI/BTECVI/BTELVI/BTCSVI

Term-End Examination

December, 2013

BME-017 : STRENGTH OF MATERIALS

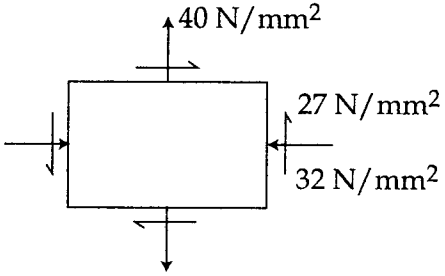
Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. **All** questions carry **equal** marks. Use of scientific **calculator** is allowed.*

1. (a) Derive the relationship between modulus of elasticity and bulk modulus. 5

   (b) In an experiment, young modulus and modulus of rigidity of a material have been determined as 120GPa and 50GPa respectively. Calculate the Poisson's Ratio and modulus of the material. 5

2. Evaluate the principal stresses and principal planes for the state of stress shown in figure. 10



3. A shaft is to be subjected to a bending moment of $6kN^{-m}$ along with a torque of $8.5kN^{-m}$. Shaft is to be made of a material with safe strength values in tension, compression and shear of $125N/mm^2$. $105N/mm^2$ and $84N/mm^2$ respectively. Find the diameter of the shaft ? **10**

4. A simply supported beam is carrying a uniformly distributed load of 2kN/m over a length of 6m from the left end and points loads 6kN, 3kN and 4kN at distances of 7m, 8m and 9m, respectively. The length of the beam is 12m. Draw SF diagram and BM diagram for the beam and find the maximum BM. **10**

5. A rectangular beam 200mm × 300mm is 8m long and is simply supported at the ends. It carries a point load of 45kN at midspan. Find the maximum bending stresses in the beam. **10**

6. A rectangular beam, having section 80mm × 120mm carries a uniformly distributed load of 40kN/m over a span of 2m and an axial compressive force of 10kN. Calculate **10**

   (a) Maximum fibre stress,

   (b) Fibre stress at a point 0.50m from the left end of the beam and 40mm below the neutral axis.

7. When a concentrated force of 1kN is applied at the midspan point of a simply supported beam, a static deflection of 5mm is produced. The same load produces a maximum stress of 158 MN/m^2. Determine the magnitude of the instantaneous stress produced when a weight of 10 kg is allowed to fall through a height of 12 mm on to the beam at midspan. What will be the instantaneous deflection ? 10

8. A steel shaft transmits 105kW at 160 RPM. If the shaft is 100 mm diameter, find the torque on the shaft and the maximum sheat stress induced. Find also the twist of the shaft in a length of 6m. Take $G = 8 \times 10^4 N/mm^2$. 10

9. A steel pipe 100mm external diameter and 75 mm internal diameter is subjected to an internal pressure of 14 MN/m^2 and an external pressure of 5.5 MN/m^2. Find the distribution of loop stress across the wall of the pipe. 10

10. A leaf spring having a span of 1.40m consists width and thickness of leaves to be 100mm and 12mm respectively. The maximum bending stress is $150N/mm^2$ and the spring must absorb 125000 N^{-mm} when straightened. Calculate the number of leaves and initial curvature. Take $E = 200GPa$. 10