No. of Printed Pages : 4

BME-017

02753

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

BTCLEVI/BTMEVI/BTECVI/BTELVI/BTCSVI

Term-End Examination

December, 2012

BME-017 : STRENGTH OF MATERIALS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. All question carry equal marks. Assume suitable missing data, if any.*

1. A hollow steel column of external diameter 250mm has to support an axial load of 2000 kN. If the ultimate stress for the steel column is 480N/mm^2, determine the internal diameter of the column allowing load factor of 4. 10

2. A reinforced concrete column is 300mm × 300mm in section. The column is provided with 8 bars of 20mm diameter. The column carries a load of 360 kN. Determine the stresses in concrete and the steel bars. Take E_s=2.1x10^5 N/mm^2 and E_c=0.14x10^5 N/mm^2. 10

3. Two planes AB and BC which are at right angles carry shear stresses of intensity 17.5N/mm^2, while these planes also carry a tensile stress of 70N/mm^2 and a compressive stress of 35 N/mm^2 respectively. Determine the principal planes and the principal stresses. Also determine the maximum shear stress and the planes on which it acts. **10**

4. A timber beam as shown in fig1 is freely supported on supports 6m apart. It carries a uniformly distributed load of 12kN per meter and a concentrated load of 9.5kN at 2.5m from the left support. If the stresses in timber is not to exceed 8N/mm^2. Design a suitable rectangular section making depth twice the width. **10**

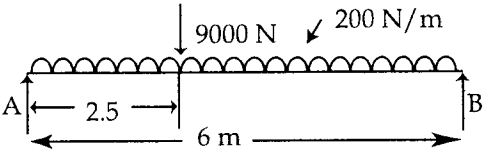

Fig. 1

5. A beam AB 10m long has supported at its ends A and B. It carries a point load of 5kN at 3m from A and a point load of 5kN at 7m from A and a uniformly distributed load of 1kN/m between the point loads. Draw shear force and bending moment diagram for the beam. **10**

6. A beam is 10m long and is simply supported at the ends. It carries concentrated loads of 100kN and 60kN at distances of 2m and 5m respectively from the left end. Determine the deflection under each load and the maximum deflection. Take $I = 18 \times 10^8$ mm^4 and $E = 200$kN/mm^2. 10

7. A shaft has to transmit 105kW power at 160rpm. If the shear stress is not to exceed 65N/mm^2 and the twist in a length of 3.5m must not exceed 1°. Determine the suitable diameter of the shaft. Take $C = 8 \times 10^4$ N/mm^2. 10

8. A cylindrical shell 900mm long, 150mm internal diameter, having a thickness of metal 8mm is filled with a fluid at atmospheric pressure. If an additional 20,000 mm^3 of fluid is pumped into the cylinder, determine: 10

   (a) The pressure exerted by the fluid on the cylinder and

   (b) The hoop stress induced.

   Take $E = 2 \times 10^5$ N/mm^2 and $1/m = 0.3$

9. For a close coiled helical spring subjected to an axial load of 200N having 12 coils of wire of 16mm diameter and mean diameter of 25cm. Determine: 10

   (a) The strain energy stored

   (b) Axial deflection.

   (c) Maximum torsional shear stress in the wire.

   (d) Maximum shear stress using Waht's Correction Factor. Take $G = 80$GN/m^2.

10. Two bars each of length l and of the same material are each subjected to the same axial tensile force P. The first bar has a uniform diameter 2d. The second bar has a diameter d for a length $l/3$ and a diameter 2d for the remaining length. Compare the strain energies of two bars. 10