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BME-017

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

BTCLEVI / BTMEVI / BTELVI / BTCSVI / BTECVI

Term-End Examination

00573

December, 2018

BME-017 : STRENGTH OF MATERIALS

Time : 3 hours *Maximum Marks : 70*

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

1. Draw and describe stress-stain curve for mild steel. *10*

2. A steel rod of 3 cm diameter and 5 m long is connected to two grips and the rod is maintained at a temperature of 95°C. Determine the stress and pull exerted when the temperature falls to 30°C, if

   (i) the ends do not yield, and

   (ii) the ends yield by 0·12 cm. *10*

   (Take $E = 2 \times 10^5$ MN/m^2, and $\alpha = 12 \times 10^{-6}$/°C.

3. The principal tensile stresses at a point across two perpendicular planes are 100 N/mm^2 and 50 N/mm^2. Determine the normal, tangential and resultant stresses on a plane inclined at 30° to the axis of the minor principal stress. *10*

4. Calculate instantaneous stress produced in a bar 10 cm^2 in area and 3 m long by the sudden application of a tensile load of unknown magnitude, if the extension of the bar due to suddenly applied load is 1·5 mm. Also determine the suddenly applied load. *10*

   Take $E = 2 \times 10^5$ N/mm^2.

5. A simply supported beam of length 6 m, carries point loads of 3 kN and 6 kN at distances of 2 m and 4 m from left hand. Draw the shear force (SF) and bending moment (BM) diagrams for the beam. *10*

6. A steel plate of width 60 mm and of thickness 10 mm is bent into a circular arc of radius 10 m. Determine the maximum stress induced and the bending moment which will produce the maximum stress. *10*

   Take $E = 2 \times 10^5$ N/mm^2.

7. A rectangular column of width 120 mm and of thickness 100 mm carries a point load of 120 kN of an eccentricity of 10 mm. Determine the maximum and minimum stresses at the base of the column. *10*

8. A beam 3 m long, simply supported at its ends, is carrying a point load W at the centre. If the slope at the ends of the beam should not exceed 1°, find the deflection at the centre of the beam. *10*

9. Prove that the torque transmitted by a solid shaft when subjected to torsion is given by

$$T = \frac{\pi}{16} \tau D^3,$$

where D = Diameter of solid shaft, and

τ = Maximum shear stress. *10*

10. A thin cylindrical shell of 120 cm diameter, 1·5 cm thick and 6 m long is subjected to internal fluid pressure of 2·5 N/mm^2. If the value of E = 2×10^6 N/mm^2 and Poisson's ratio = 0·3, calculate

(a) change in diameter,

(b) change in length, and

(c) change in volume. *10*