No. of Printed Pages : 4

BME-017

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

BTCLEVI / BTMEVI / BTELVI / BTCSVI / BTECVI

Term-End Examination

June, 2014

01240

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) Define *1×5=5*

(i) Thermal stresses

(ii) Hoop stress

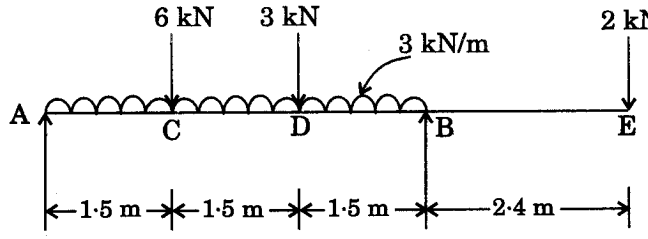
(iii) Principal planes

(iv) Principal stresses

(v) Poisson's ratio

(b) The principal stresses at a point across two perpendicular planes are 75 MN/m^2 (tension) and 35 MN/m^2 (tension). Find the normal, tangential and resultant stress and its obliquity on a plane at 20° with the major principal plane. *5*

2.



Draw the B.M. and S.F. diagrams, giving the important numerical values. Calculate the maximum B.M. and the point at which it occurs. *10*

3. (a) Define *1×4=4*

(i) Neutral Axis

(ii) Section Modulus

(iii) Beam of uniform strength

(iv) Radius of curvature

(b) A symmetrical section 200 mm deep has a moment of inertia of $2{\cdot}26 \times 10^{-5}$ m^4 about its neutral axis. Determine the longest span over which, when simply supported, the beam would carry a uniformly distributed load 4 kN/m run without the stress due to bending exceeding 125 MN/m^2. *6*

4. A load of 75 kN is carried by a column, made of cast iron. The external and internal diameters are 200 mm and 180 mm respectively. If the eccentricity of the load is 35 mm, find

   (i) The maximum and minimum stress intensities.

   (ii) Up to what eccentricity, is there no tensile stress in the column ? *10*

5. An I-section with rectangular ends has the following dimensions :

   Flanges : 10 cm × 1 cm

   Web : 12 cm × 1 cm

   If this section is subjected to a bending moment of 5 kNm and a shearing force of 5 kN, find the maximum tensile and shear stresses induced in it. *10*

6. A cantilever of length 6 meters carries a uniformly distributed load of 10 kN/m over the whole length. If $\varepsilon = 200 \times 10^6$ kN/m^2 and $I = 30 \times 10^{-5}$ m^4, determine the following :

   (i) Slope at the free end

   (ii) Deflection at the free end *10*

7. A solid steel shaft has to transmit 75 kW at 200 rpm. Taking allowable shear stress as 70 MN/m^2, find suitable diameter for the shafts if the maximum torque transmitted on each revolution exceeds the mean by 30%. *10*

8. A closed coiled helical spring has mean diameter of 75 mm and spring constant of 90 kN/m. It has 8 coils. What is the suitable diameter of the spring wire if maximum shear stress is not to exceed 250 MN/m^2 ? Modulus of rigidity of the spring wire material is 80 GN/m^2. What is the maximum axial load, the spring can carry ? *10*

9. A steel bar 4 cm × 4 cm in section, 3 m long is subjected to an axial pull of 128 kN. Taking E = 200 GN/m^2, calculate the change in the length of the bar and the amount of energy stored in the bar during the extension. *10*

10. A thin spherical vessel of diameter ϕ 800 mm and thickness 6 mm is filled with a liquid at an internal pressure of 1·5 N/mm^2. Find the increase in volume of the vessel, taking $E = 2 \times 10^5$ N/mm^2 and $\nu = 0{\cdot}3$. *10*