

Total No. of Questions : 8]

[Total No. of Printed Pages : 2

[2]

Roll No

AU/ME-3002 (CBGS)**B.E. III Semester**

Examination, May 2018

Choice Based Grading System (CBGS)**Strength of Materials***Time : Three Hours**Maximum Marks : 70*

- Note:** i) Attempt any five questions out of eight.
ii) All questions carry equal marks.

1. a) A 5m long steel bar that is 2.5 cm in dia is stretched 2.0 mm by a load of 80 kN in pulling it axially. Calculate the stress, strain and modulus of rigidity of the bar.
- b) A rectangular bar consists of two sections, AB is 25 mm square and 250 mm long, BC is 12 mm square and 250 mm long. For an axial tensile load of 20 kN applied to the bar, Determine :
 - i) Change in length of the complete bar
 - ii) Change in dimensions of each portion.
 Take $E = 80 \text{ GN/m}^2$ and Poisson's ratio = 0.3
2. a) Define principal stresses.
- b) At a point in an elastic material under strain, there are normal stresses of 50 MN/m^2 and 30 MN/m^2 respectively at right angles to each other with a shearing stresses of 25 MN/m^2 . Find the principal stresses and position of the principal planes if 50 MN/m^2 is tensile and 30 MN/m^2 is compressive. Find also the maximum shear stress and its plane.

3. a) How are beams classified. Give a brief account.
- b) Derive the relation between bending moment and shear force in a beam. What do you mean by point of contraflexure.
4. A 10m long beam ABC is simply supported at A and B. B being 2m from the right end of the beam. It carries point loads of 8kN and 4kN at a distance of 3 m and 5 m from A. The beam has also two infirmly distributed loads of intensity 4 kW/m for a distance of 4 m starting from A and of 6kN/m on BC. Draw the shear force and bending moment diagram.
5. a) Define the term moment of resistance.
- b) A hollow circular bar used as a beam has outside diameter twice the inner dia. If it is subjected to a maximum bending moment of 40kN-m and the allowable bending stress is 100 MPa, determine the inside diameter of the bar.
6. A shaft transmits 280 kW of power at 160 rpm. Determine: (a) dia of solid shaft to transmit the power (b) the inner and outer dia of hollow circular shaft if the ratio of outer and inner dia is 3/2 (c) the percentage saving in the material on using a hollow shaft.
7. a) What is a strut? How does it differ from a column?
- b) Determine the crippling load for a 5 m long fixed end timbre column of 150 mm × 200 mm section if the Young's modulus is 17 GPa. Derive the formula used.
8. Write short notes on any two:
 - a) Stress-strain in diagram of mild steel
 - b) Strain Energy in Bending
 - c) Theory of failure
