Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(ME) (2012 Onwards)
(Sem.–3)

STRENGTH OF MATERIALS – I

Subject Code : BTME-301
M.Code : 59111

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

(a) Distinguish between longitudinal and lateral strain.

(b) Define Temperature Stresses.

(c) What do you understand by '*point of contraflexure*'. Does it exist in a cantilever?

(d) Define Bending Moment and write its units.

(e) What is the significance of polar moment of inertia in torsion of circular shafts?

(f) Differentiate between crushing and buckling.

(g) Write Rankine-Gordon's formula.

(h) Define Slenderness ratio.

(i) Distinguish between slope and deflection of a beam.

(j) Name different methods used to find slope in a beam.

SECTION-B

2. Write a note on two dimensional stress systems with a suitable example.

3. A cantilever PQRS, 7 m long is fixed at P such that PQ = QR = 2 m, and RS = 3 m. It carries loads of 3 kN, 3 kN and 2 kN at Q, R and S respectively in addition to uniformly distributed load of 1 kN/m run between P and Q and 2 kN/m run between R and S. Draw shearing force and bending moment diagrams.

4. A hollow circular bar having outside diameter twice the inside diameter is used as a beam. From the bending moment diagram of the beam, it is found that the bar is subjected to a bending moment of 40 kNm. If the allowable bending stress in the beam is to be limited to 100 MN/m^2, find the inside diameter of the bar.

5. Derive the torsion formula.

6. A slender pin ended aluminium column 1.8 m long and of circular cross-section is to have an outside diameter of 50 mm. Calculate the necessary internal diameter to prevent failure by buckling if the actual load applied is 13.6 kN and the critical load applied is twice the actual load. Take, E for aluminium as 75 GN/m^2.

SECTION-C

7. (a) Explain stress strain diagram for brittle materials.

   (b) Describe ellipse of stress and its applications.

8. A steel girder of uniform section, 14 metres long is simply supported at its ends. It carries concentrated loads of 90 kN and 60 kN at two points 3 metres and 4.5 metres from the two ends respectively. Using Macaulay's method, calculate:

   (a) The deflection of the girder at the points under the two loads, and

   (b) The maximum deflection. Take, $I = 64 \times 10^{-4}$ m^4, and $E = 210 \times 10^6$ kN/m^2.

9. A hollow shaft of diameter ratio 3/8 is required to transmit 600 kW at 110 rpm, the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MN/m^2 and the twist in a length of 3 m not to exceed 1.4 degrees. Calculate the maximum external diameter satisfying these conditions. Take, modulus of rigidity as 84 GN/m^2.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.