Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 09

B.Tech.(Marine Engg.) (2013 Onwards)/
B.Tech.(ME) (2011 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. Define yield stress.

b. Explain the significance of modulus of rigidity.

c. What are principal planes?

d. What do you mean by point of contraflexure?

e. What is a flitched beam?

f. Discuss the factors affecting flexural rigidity of a beam.

g. Why a hollow shaft is preferred over a solid shaft?

h. What is the equivalent length of a column?

i. Differentiate between a column and a strut.

j. A cantilever beam carries a load 'W', which is distributed uniformly over its entire length. If the same load is placed at the free end of the same cantilever, then what will be the ratio of maximum deflection in the first case to that in the second case?

SECTION-B

2. Explain :

   (a) Factor of safety and its significance.

   (b) Slenderness ratio and its significance.

3. A square bar of 25 mm side is held between two rigid plates and loaded by an axial pull 'P' equals to 300 kN, as shown in Fig. 1. Determine the reactions offered by supports A. Take E = 200 GPa.

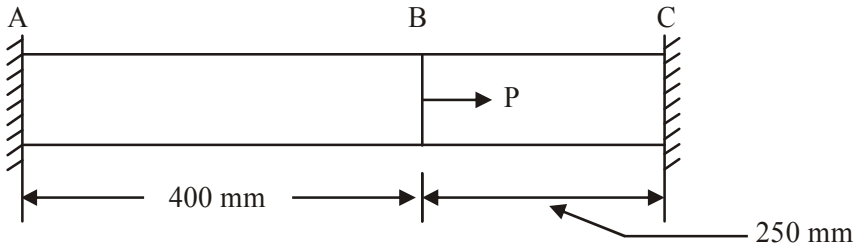

Fig.1

4. Determine the diameters of a hollow shaft transmitting 300 kW at 250 rpm. The maximum shear stress in the shaft should not exceed 30 MPa. Assume the ratio of inner to outer diameter (d_i/d_o) = 0.75and modulus of rigidity (C) = 100 GPa.

5. Find the Euler's crippling load for a hollow cylindrical cast iron (E = 80GPa) column having 150mm external diameter and 20 mm thickness. The column is 6 m long and hinged at both ends.

6. The mid span deflection of a simply supported beam (span = 5m) loaded with a concentrated load 20kN at the centre, is 2.5 mm. Determine the maximum deflection if the concentrated load is replaced by a UDL of intensity 4 kN/m acting over the whole span of the beam.

SECTION-C

7. The state of stress on an element is shown in Fig. 2. Determine the magnitudes and directions of principal stresses and also the greatest shear stress. Show all the results on properly oriented planes.

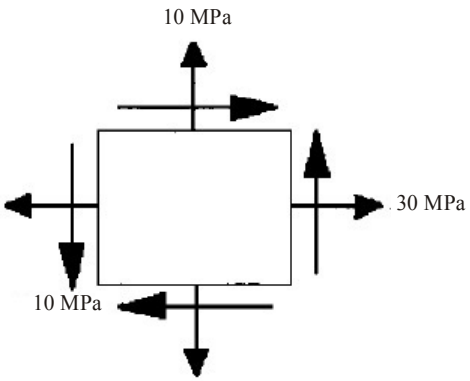

Fig. 2

8. Draw shear force and bending moment diagrams for the beam loaded in Fig. 3. Label the salient points.

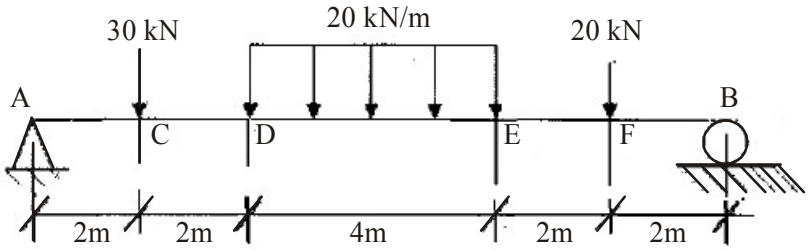

Fig. 3

9. Stating the assumptions made, derive the complete flexural formula : $\frac{M}{I_{NA}} = \frac{\sigma}{y} = -\frac{E}{r}$.

The symbols have their usual meaning.

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.