

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC SEM-I Examination-Dec-2011

Subject code: X11901**Date: 21/12/2011****Subject Name: Strength of Materials****Time: 10.30 am -1.00 pm****Total marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Enlist advantages and disadvantages of fixed beams. **03**
(b) Define the following terms: **04**
- Point of Contra flexure
 - Shear Force
 - Polar section modulus
 - Angle of twist
- (c) Draw the S.F and B.M diagram for the beam loaded as shown in the figure1. **07**

- Q.2** (a) For the infinitesimal element shown in the figure-2, find the normal stress, tangential stress and resultant stress on the plane AB. Use any method. **07**
(b) Calculate the slope at supports A and B as well deflection at C in terms of EI for the beam as shown in figure-1. **07**

OR

- (b) Analyze the continuous beam as shown in figure-3 and draw SFD and BMB for the same. **07**

- Q.3** (a) Draw the S.F and B.M diagram for the beam loaded as shown in the figure4. **07**
(b) For torsion of a circular shaft, derive the equation $T/I_p = \tau/R = C\theta/L$ with usual notations **07**

OR

- Q.3** (a) Plot Shear stress distribution diagram for I-section, T-section, H-section, Rectangular section, Circular section **05**
(b) A hollow circular shaft transmits 800 kW at 150 RPM. Its maximum torque is 25% more than the average torque. The ratio of internal to external radius is 0.8. If the maximum shear stress and angle of twist in 3 m length are not to exceed 80 MPa and 3° then find the required sectional dimension of the shaft. Take modulus of rigidity: $C = 85 \text{ GPa}$. **09**

- Q.4** (a) Write the equation for instantaneous stress for impact loading. Using the same show that the stress induced due to sudden loading is twice that of the stress due to gradual loading. **05**
(b) A tie beam of a roof truss consists of an angle $90 \times 90 \times 8 \text{ mm}$ is subjected to a load of 120 kN. The tie is connected to a gusset plate by welding. Design the joint, if the size of the weld is 6 mm. Take maximum allowable shear stress in the weld as 100 MPa. The distance between the neutral axis and the edges of the angle section are 28.7 mm and 61.3 mm respectively. **09**

OR

- Q.4** (a) Differentiate riveted and welded connections. 05
 (b) A steel bar 3 m long and 2500 mm² in area hangs vertically, which is securely fixed on its lower end. If a weight of 15 kN falls on the collar from a height of 10 mm, determine the stress developed in the bar. What will be the strain energy stored in the bar? Take E as 200 GPa. 09
- Q.5** (a) Analyze the fixed beam as shown in figure-5 and draw SFD and BMB for the same. 07
 (b) Calculate the strain energy stored and instantaneous stress developed in the bar subjected to impact loading of 500 N falling from the height of 500mm. The bar is having diameter of 20mm, and length of 1.5m. Take E as 120 GPa. 07
- OR**
- Q.5** (a) Analyze the continuous beam as shown in figure-6 and draw SFD and BMB for the same. 07
 (b) Derive the formula $M/I = \sigma_b/y$ for bending with usual notations. 07

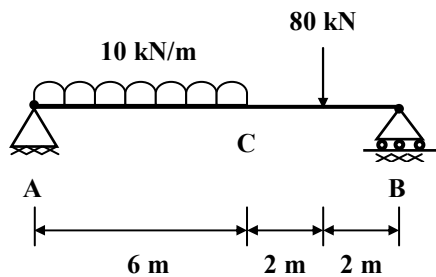


Fig. (1)

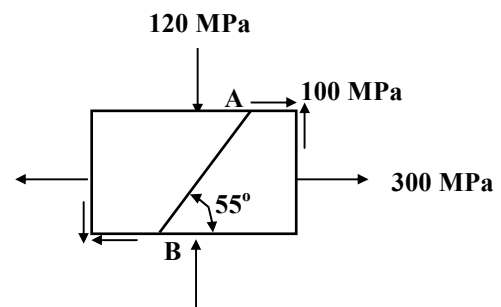


Fig. (2)

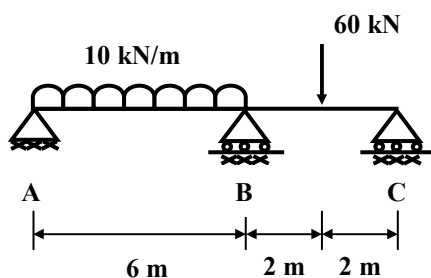


Fig. (3)

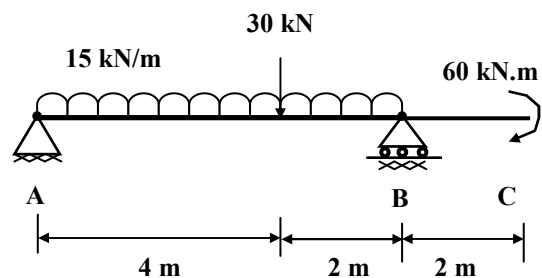


Fig. (4)

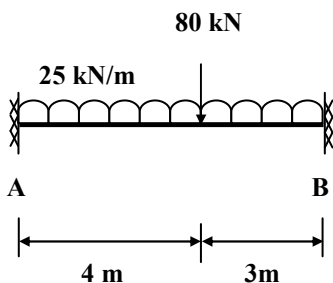


Fig. (5)

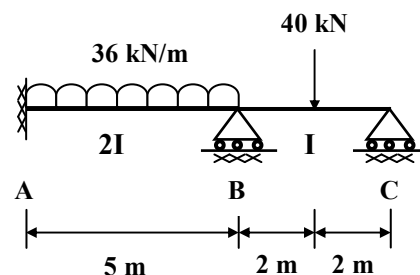


Fig. (6)
