Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–I- EXAMINATION – SUMMER 2016

Subject Code:X11901 **Date:02/06/2016**

Subject Name:STRENGTH OF MATERIALS

Time:02:30 PM to 05:00 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) Define following terms: **07**
(i) Ductility (ii) Malleability (iii) Hardness (iv) Toughness (v) Endurance limit (vi) Brittleness (vii) Creep

(b) Explain behavior of ductile material under tensile load showing the neat sketch of stress-strain curve. **07**

Q.2 (a) Calculate shear force and bending moment at salient points of the cantilever beam shown in fig. 1. Draw shear force diagram and bending moment diagram for the beam. **07**

(b) Derive expressions of relation between the rate of loading, shear force and bending moment at a section of beam. **07**

OR

(b) For torsion of a circular shaft, derive the equation $T/J = \tau/R = C\theta/L$ with usual notations. **07**

Q.3 (a) Calculate shear force and bending moment at salient points of the simply supported beam shown in fig. 2. Draw shear force diagram and bending moment diagram for the beam. **07**

(b) Find slope and deflection at free end of the cantilever beam shown in fig. 1 using any method. Take EI = constant. **07**

OR

Q.3 (a) Define the terms Strain Energy and Proof Resilience. Derive an expression for strain energy stored in a body when the load is applied gradually. **07**

(b) A steel bar of 3m length and 1000 mm^2 in cross section suddenly loaded with an axial pull of 50kN. Find maximum instantaneous stress, maximum instantaneous elongation and strain energy. Take $E = 2 \times 10^5$ N/mm^2. **07**

Q.4 (a) A tensile test specimen having a diameter 11.28 mm and a gauge length of 50 mm was tested to fracture. The load and deformation data obtained during the test were as follows: **07**

Load (kN)	0	14.9	28.5	30.6	33.3	41.0	49.7	50.7	49.7	45.1
Change in Length (mm)	0	0.04	0.08	0.12	0.20	1.00	4.00	6.00	9.00	Fail

Final gauge length = 62.5 mm, Final diameter of specimen = 9.50 mm. Determine ultimate strength, percentage elongation over the gauge length and percentage reduction in area.

(b) Calculate the slope at supports A & B and deflection at C for the simply supported beam as shown in fig. 2. Take EI = constant. **07**

OR

Q.4 (a) Find the maximum shear stress induced in a solid circular shaft of diameter 150 mm when the shaft transmits 150 kW power at 180 r.p.m. **07**

(b) Analyze the continuous beam as shown in fig. 3 and draw shear force diagram & bending moment diagram. **07**

Q.5 **(a)** Analyze the fixed beam shown in fig. 4. Draw shear force and bending moment diagram. **07**

(b) Illustrate with neat sketches different types of riveted and welded connections. **07**

OR

Q.5 **(a)** For the infinitesimal element shown in the fig. 5, find the normal stress, tangential stress and resultant stress on the plane AB. **07**

(b) A tie member of a roof truss consists of an angle 90 × 90 × 8 mm is subjected to a load of 100 kN. The tie member is connected to a gusset plate by welding. Design the welded 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. **07**

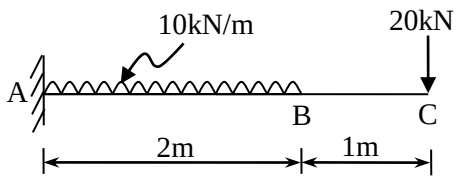

Fig. 1 Q-2(a), Q-3(b)

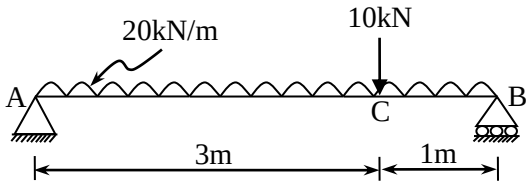

Fig. 2 Q-3(a), Q-4(b)

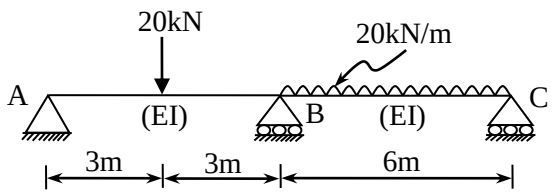

Fig. 3 Q-4(b) OR

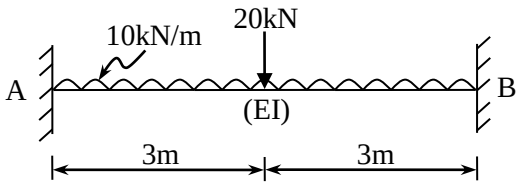

Fig. 4 Q-5(a)

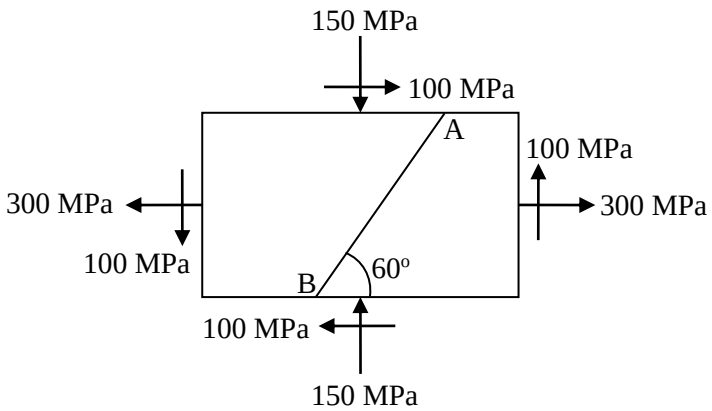

Fig. 5 Q-5(a) OR

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