Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC– SEMESTER I– • EXAMINATION –WINTER- 2016

Subject Code: X11901 **Date:07/01/2017**

Subject Name: Strength of Materials

Time: 10:30 AM to 1:00 PM **Total Marks: 70**

Instructions:

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

Q.1 **(a)** Fill in the blanks with appropriate answer. **07**

(i) The total strain energy stored in a body is known as_____

(ii) Value of shear stress on principal plane is _____

(iii) A cantilever beam carries a point load at its end , Slope is maximum at ___

(iv) Point where the value of bending moment is zero is known as _____

(v) The property of material to be drawn into form of wire is known as ___

(vi) When the solid shaft is subjected to torsion, the shear stress at its center is _

(vii) For fixed beam of span '*l*' carrying point load '*P*' at its center, the value of fixing moments are_____

(b) Draw typical stress strain curve for mild steel showing all important points. **07**

In a tension test on Metal specimen with initial diameter of 20 mm and length of 100 mm, following readings were recorded:

i) Diameter after failure = 12.6 mm

ii) Length after failure = 125 mm

iii) Failure load = 100 kN

iv) Extension of bar at 20 kN load = 0.032mm

Compute Modulus of Elasticity, % contraction in area, % elongation in length, True stress at failure, Engineering stress at failure.

Q.2 **(a)** Draw shear force and bending moment diagrams for the beam shown in fig. 1 **07**

(b) (i) Write assumption made in theory of pure Torsion **07**

(ii) Derive relationship between rate of loading, shear force and bending moment with usual notations.

Q.3 **(a)** A steel bar 3 m long and 2500 mm^2 in area hangs vertically, which is securely fixed on a collar at 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. **07**

(b) Draw shear force and bending moment diagrams for the beam shown in fig. 2. **07**

Q.4 **(a)** A machine component is subjected to the stresses as shown in the fig. 3. Find normal and shear stresses at section 60˚ with X-X axis. Find also the resultant stress on the section. **07**

(b) A hollow shaft is to transmit 200kW at 80 r.p.m. If the shear stress is not to exceed 60 MPa and internal diameter is 0.6 of external diameter, find the diameters of the shaft. **07**

Q.5 **(a)** Calculate deflections of the beam under loads for the beam shown in fig. 4. **07**

E = 200 GPa and I = 160 x 10^6 mm^4 . Use Macaulay's method.

(b) Find the defection at center of simply supported beam of length '*l*' carrying uniformly distributed load '*w*' per unit run on the whole span using moment area method. **07**

Q.6 **(a)** Explain various types of welded joints with neat sketches. Write the advantages and disadvantages of welded joint over riveted joint. **07**

(b) A fixed beam AB, 6 m long is carrying a point load of 50 kN at its center. The moment of inertia of the beam is 78 x 10^6 mm^4 and value of E for beam material is 2 x 10^5 N/mm^2. Determine (1) Fixed end moments at A & B. (2) Deflection under the load. **07**

Q.7 **(a)** Explain: Concept of strain energy, resilience, proof resilience, shear resilience, gradual loading, sudden and impact loadings. **07**

(b) Draw shear force and bending moment diagram for the beam shown in fig. 5. Support B sinks by 30 mm. Take E = 200 GPa and I = 2 x 10^8 mm^4. Use moment distribution method. **07**

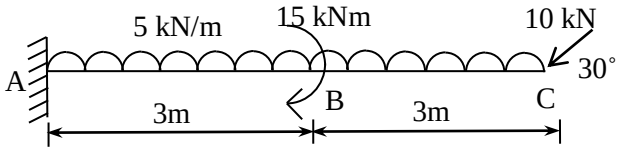

Fig. 1 Q: 2(a)

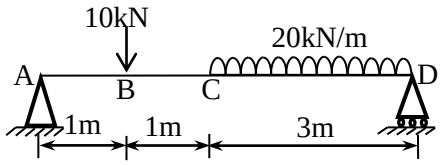

Fig. 2 Q: 3(b)

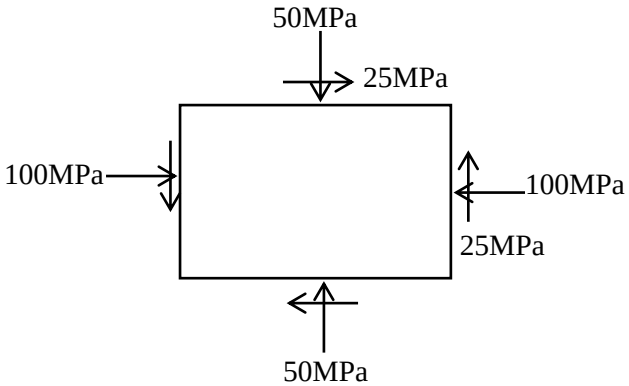

Fig. 3 Q: 4(a)

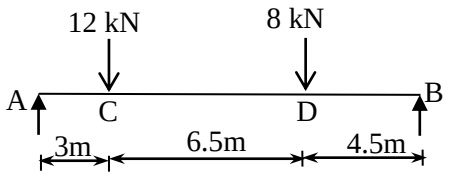

Fig. 4 Q: 5(a)

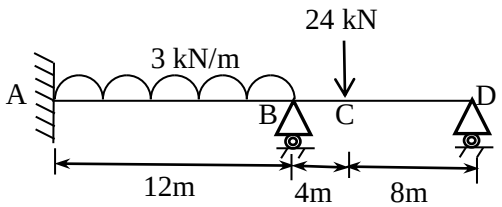

Fig.5 Q: 7(b)

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