Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–I • EXAMINATION – SUMMER • 2014

Subject Code: X11901 **Date: 21-06-2014**

Subject Name: Strength of Materials

Time: 02:30 pm - 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)** Discuss the type of failures observed in cast iron, timber and mild steel subjected to the compression test. **04**

(b) Briefly explain procedure for the measurement of Impact and fatigue test. **06**

(c) Differentiate between:- **04**

1) Brittle materials & Ductile materials

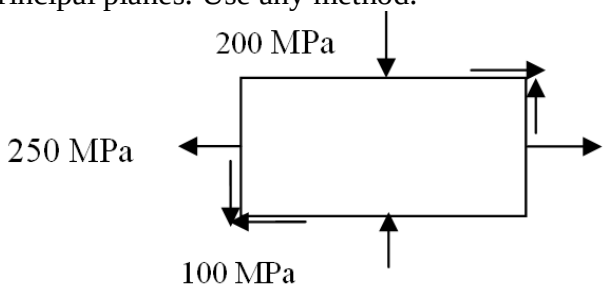
2) Brinell Hardness Test & Rockwell Hardness Test

Q.2 **(a)** Draw shear force diagram (SFD) and bending moment diagram (BMD) for cantilever beam having span 6 m and carrying UDL of 50 kN/m and also carrying point load of 50 kN at distance 2 m from support. **07**

(b) Define the terms Complementary shear stress, Resultant stress, Angle of obliquity. **07**

OR

(b) For the element shown in the following figure, find the normal stress, tangential stress and resultant stress on the plane AB. Also, find principal stresses and principal planes. Use any method. **07**



Q.3 **(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. **07**

(b) Draw SFD and BMD for the continuous beam as shown in figure 1 using moment distribution method.. **07**

OR

Q.3 **(a)** A solid circular shaft of 150 mm is subjected to twisting moment of 6 kNm and a bending moment of 10 kNm. Determine principal stresses in the section and specify the position of the plane on which they act. **07**

(b) A solid circular steel shaft (G = 80 GPa), 6 m long transmit 500 kW of power at 750 r.p.m. If the allowable shearing stress is limited to 75 MPa and allowable angle of twist is 0.047 radian, determine the minimum permissible diameter of the shaft. **07**

Q.4 **(a)** Find the deflection at the centre of the span AB for a simply supported beam of uniform flexural rigidity EI by Moment area method, if the span L of the beam carries two symmetrically placed loads P at one-third of the span from each end A and B **07**

(b) Find out the fixing moments, support reactions and maximum deflection for a fixed beam AB carrying an eccentric point load at C. Compare the values with that of simply supported beam. **07**

OR

Q.4 **(a)** A load of 150 N falls through a height of 2.5 cm on to a collar rigidly attached to the lower end of a vertical bar 2 m long and of 2 cm^2 cross-sectional area. The upper end of the vertical bar is fixed. Determine. **07**

(1) Max. Instantaneous stress induced in the bar.
(2) Max. Instantaneous elongation.
(3) Strain energy stored in the vertical rod.
Take E = 2.1 x 10^5 N/mm^2.

(b) Analyse the beam shown in figure 2 by slope deflection method. Also draw S.F.D. and B.M.D. Also consider the relative values of moments of inertia of span BC is doubled than span AB and the modulus of elasticity E is constant. **07**

Q.5 **(a)** A beam 5m long, simply supported at its ends is carrying a point load of 100 KN at its centre. The moment of inertia of the beam is given 78 x 10^6 mm^4. If E for the material of beam = 2.1 x 10^5 N/mm^2. **07**

Calculate: (1) Deflection
(2) Slope at the supports

(b) State and explain types of joints according to connecting element and connection pattern. **07**

OR

Q.5 **(a)** Two plates of 20 mm thickness are to be connected by a single riveted lap joint with rivets of 20 mm nominal diameter. Find the necessary pitch of the rivets. Take shear stress as 120N/mm^2, bearing stress as 450 N/mm^2 and tearing strength as 150 N/mm^2. **07**

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

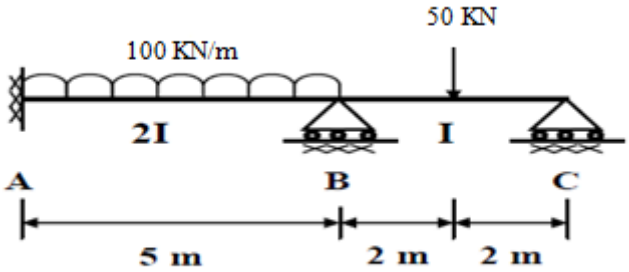


Figure 1(Q-3(b))

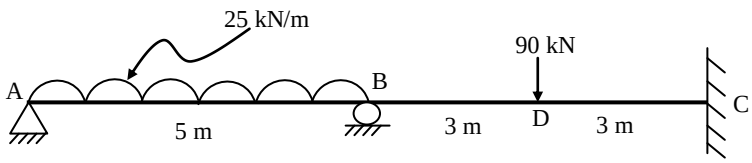


Figure 2(Q-4(b))

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