

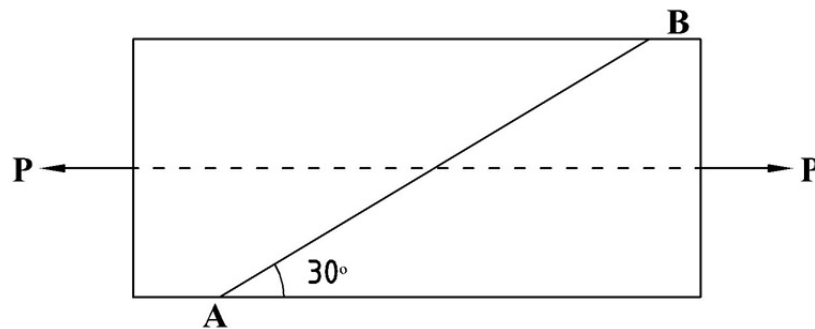
GUJARAT TECHNOLOGICAL UNIVERSITY

P.D.D.C. Sem- I Examination January 2010

Subject code: X 11901**Date: 11 / 01 / 2010****Subject Name: Strength of Materials****Time: 11.00 am – 1.30 pm****Total Marks: 70****Instructions:**

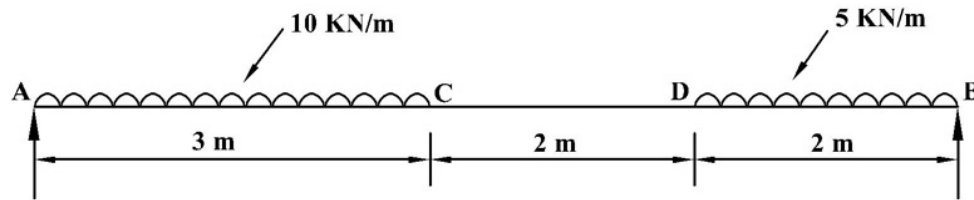
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain following terms in brief. **04**
 (1) Hardness.
 (2) Toughness.
 (3) Endurance limit.
 (4) Malleability.
- (b) Explain in brief basic characteristic stress strain curves for ductile and brittle material **03**
- (c) Explain in brief method of measurement of Impact test and fatigue test. **07**
- Q.2** (a) A rectangular bar is subjected to a direct stress (p) in one plane only. Prove that the normal and shear stresses on an oblique plane are given by $p_n = p \cos^2 \theta$ and $p_t = (p/2) \sin 2\theta$. **07**
- (b) Two wooden pieces 10 cm x 10 cm in cross section are glued together along line AB as shown in figure below. What max. axial force P can be applied of the allowable shearing stress along AB is 1.2 N/mm^2 . **07**

**OR**

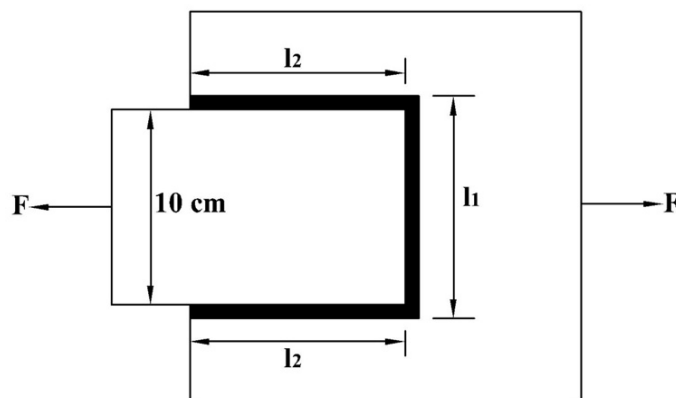
- (b) At a point on a strained material the principal stresses are 100 N/mm^2 (tensile) and 60 N/mm^2 (compressive). Determine the normal stress, shear stress and resultant stress on a plane inclined at 50° to the axis of major principal stress. Also determine the max. shear stress at the point. **07**
- Q.3** (a) Draw the S.F. and B.M. diagrams for a simply supported beam carrying a Uniformly Varying Load from zero at each end to w per unit length at the centre. **07**

- (b) Draw the S.F. and B.M. diagrams of a simply supported beam of length 7m carrying U.D.L. as shown in fig. below. 07



OR

- Q.3** (a) Derive expression for the torque transmitted by a hollow circular shaft of external dia. = D_0 and internal dia. = D_i . 07
- (b) A solid shaft of diameter 80mm is subjected to a twisting moment of 8MN-mm and a bending moment of 5MN-mm at a point. 07
Determine (1) Principal stresses.
(2) Position of the plane on which they act.
- Q.4** (a) Define term riveted joint. Describe different types of failure of a riveted joint. 07
- (b) A plate 10cm wide and 1.20cm thick is joined with another plate by a single fillet lap weld and a double parallel fillet weld as shown in fig. below. The max. tensile and shear stresses are 75N/mm^2 and 55N/mm^2 respectively. Find the length of each parallel fillet of the joint is subjected to a total load of 90000N. 07



OR

- Q.4** (a) Define (1) Resilience (2) Impact loading. And derive an expression for strain energy stored in a body when the load is applied suddenly. 07
- (b) A load of 100N falls through a height of 2cm on to a collar rigidly attached to the lower end of a vertical bar 1.5m long and of 1.5cm^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 $E = 2.1 \times 10^5 \text{ N/mm}^2$.
- Q.5** (a) What do you mean by a fixed beam and a continuous beam? What are the advantages and disadvantages of a fixed beam over a simply supported beam? 07

- (b) A fixed beam AB, 6m long is carrying a point load of 50KN at its centre. The moment of inertia of the beam is $78 \times 10^6 \text{ mm}^4$ and value of E for beam material is $2 \times 10^5 \text{ N/mm}^2$. 07
Determine (1) Fixed end moments at A & B.
(2) Deflection under the load

OR

- Q.5 (a)** Prove that the relation $M = EI \frac{d^2y}{dx^2}$ 07

Where: M = Bending moment

E = Young modulus

I = M.O.U.

- (b) A beam 6m long, simply supported at its ends is carrying a point load of 50KN at its centre. The moment of inertia of the beam is given $78 \times 10^6 \text{ mm}^4$. If E for the material of beam = $2.1 \times 10^5 \text{ N/mm}^2$. 07
Calculate: (1) Deflection
(2) Slope at the supports.
