Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III • EXAMINATION – WINTER • 2014

Subject Code: 2130608 Date: 26-12-2014

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)** Select the appropriate answer from given options and rewrite the complete sentence. **07**

(1)When shear force at a point is zero,then bending moment at that point will be
(a)Zero
(b)Maximum
(c) Minimum
(d)Infinity
(2)At fixed support, the possible reactions are
(a)Vertical (V) only
(b)Horizontal (H) only
(c) Moment (M) only
(d) V,H,M all
(3)The force of friction between two bodies in contact
(a)Depends on the area of their contact
(b)Depends on the roughness of the surfaces
(c) Depends on the relative velocity between them
(d) All of the above
(4)At neutral axis bending stress is
(a)Minimum
(b)Maximum
(c) Zero
(d)Infinity
(5)For any section shear stress at the top edge is
(a)Maximum
(b)Minimum
(c) Zero
(d)Infinity
(6)When a body is subjected to two tensile stresses of equal magnitude on two mutually perpendicular planes, the radius of Mohr's circle will be
(a)Zero
(b)Maximum
(c) Minimum
(d) Infinity
(7) The materials which have the same elastic properties in all directions are
(a)Isotropic
(b)Brittle
(c) Homogeneous
(d) Hard.

(b) Define the following terms. **07**

(1) Hardness (2) Brittleness (3) Ductility (4) Malleability
(5) Elasticity (6) Strength (7) Toughness.

Q.2 **(a)** A simply supported overhanging beam ABCD is loaded as shown in Fig:1. Calculate **07**

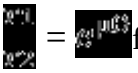
shear force and bending moments at salient points and plot shear force and bending moment diagrams. Also locate point of contraflexure from support A.

(b) A ladder 7 m long rests against a vertical wall with which it makes an angle of 45^0 and resting on a floor. If a man whose weight is one half of that the ladder, climbs it. At what distance along the ladder will he be when ladder is about to slip?μ_s = 1/3 at wall and 1/2 at floor. **07**

OR

(b) Two blocks A and B are resting against a wall and the floor as shown in Fig:2. Find horizontal force P applied to the lower block that will hold the system in equilibrium. Take μ = 0.25 at floor, μ = 0.3 at wall and μ = 0.2 between the blocks. **07**

Q.3 **(a)** Find support reactions for the beam shown in Fig:3. **07**

(b) Prove with usual notations  for belt friction. **07**

OR

Q.3 **(a)** Calculate member forces in simply supported truss shown in Fig:4. **07**

(b) Draw shear force and bending moment diagrams for the beam shown in Fig:5. **07**

Q.4 **(a)** Prove with usual notations  . **07**

(b) A circular pipe of external diameter 70 mm and thickness 8 mm is used as a simply supported beam over an effective span of 2.5 m. Find the maximum concentrated load that can be applied at the centre of the span if permissible stress in the tube is 150 MPa. **07**

OR

Q.4 **(a)** Prove with usual notation the maximum shear stress for a rectangular section is 1.5 times the average shear stress. **07**

(b) A beam of I section, 50 cm deep and 20 cm wide, has equal flanges 2 cm thick and web 1 cm thick. It carries a shear force of 100 kN at its cross section. Determine the shear stress distribution in the beam and the ratio of maximum shear to mean shear. Show the values with the help of neat sketch. **07**

Q.5 **(a)** Derive the Torsion equation with usual notations. **07**

(b) A hollow shaft of internal diameter 150 mm and external diameter 250 mm is subjected to a torque of 200 kN.m. Determine the maximum shear stress developed. Determine the power transmitted by this shaft if it runs at 200 rpm. If the modulus of rigidity is 80 GPa, find the shear stress developed at a point on the internal (diameter) periphery of the shaft. **07**

OR

Q.5 **(a)** At a point in a strained material the principal stresses are 100 N/mm^2 (tensile) and 60 N/mm^2 (compressive). Determine analytically normal stress, shear stress and resultant stress on a plane inclined at 50^0 to the axis of major principal stress. **07**

(b) At a point in a strained material the normal tensile stress are 60 N/mm^2 and 30 N/mm^2. Determine by Mohr's circle, the resultant intensity of stress on a plane inclined at 40^0 to the axis of the minor stress. **07**

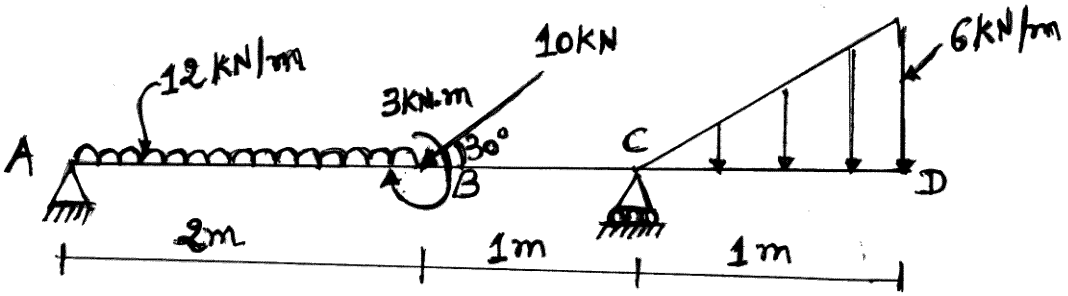


Fig : 1

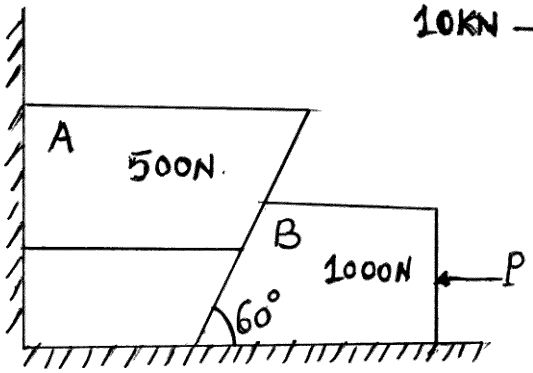


Fig : 2

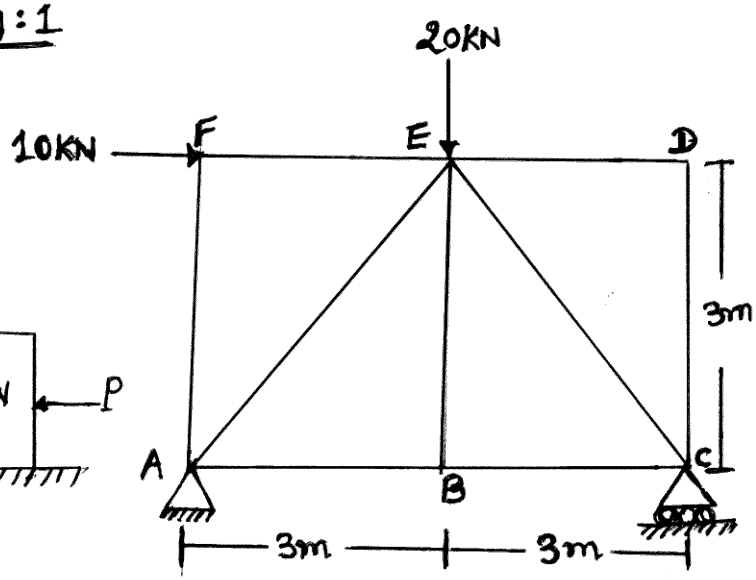


Fig : 4

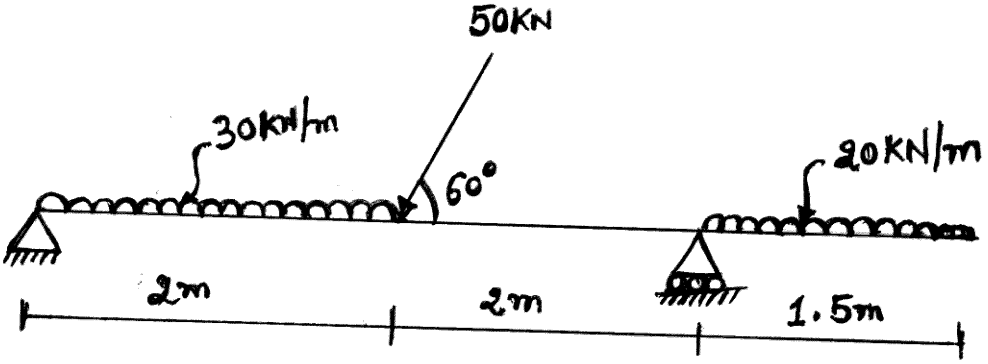


Fig : 3

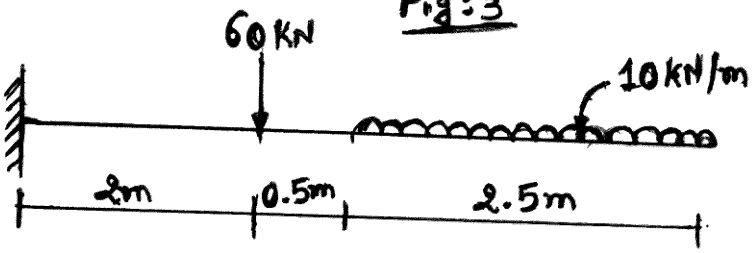


Fig : 5

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