

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- I & II (OLD) EXAMINATION – WINTER 2019

Subject Code: 110010

Date: 10/01/2020

Subject Name: Mechanics Of Solids

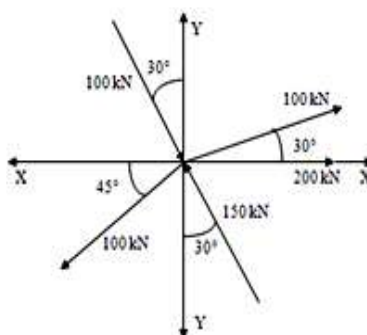
Time: 10:30 AM TO 01:00 PM

Total Marks: 70

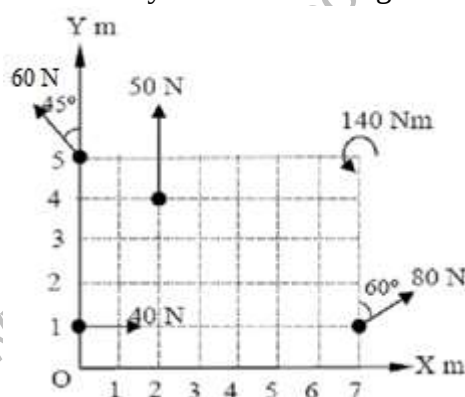
Instructions:

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

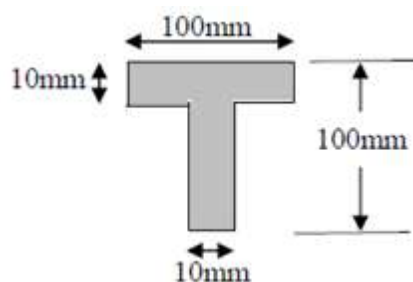
- Q.1** (a) Differentiate between: (i) Scalar Quantities and Vector Quantities, [04]
(ii) Fundamental units and derived units.
- (b) Define force and explain various force systems with illustrations. [03]
- (c) Find Magnitude & direction of resultant force as shown in figure below. [07]



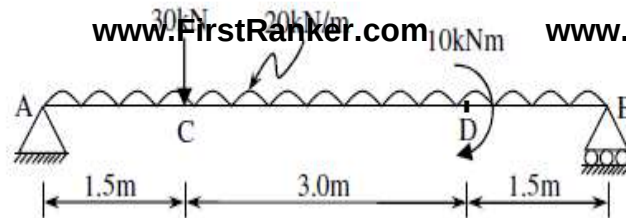
- Q.2** (a) Determine magnitude, direction and perpendicular distance from 'O', of the resultant for the force system shown in figure below. [07]



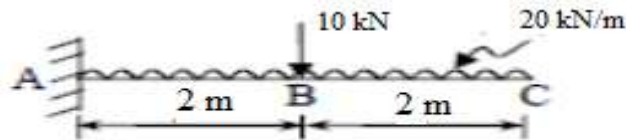
- (b) The T- section of beam as shown in figure below, determine the centroid of the section of the beam. [07]



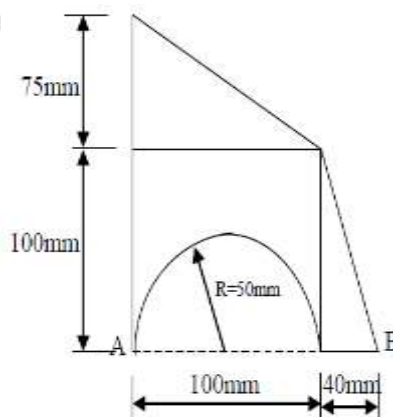
- Q.3** (a) Find the reactions at the fixed support for a beam loaded as shown in figure below. [07]



- (b) Calculate shear force and bending moment at salient points of the beam shown in figure below. Draw shear force diagram and bending moment diagram for the beam. [07]

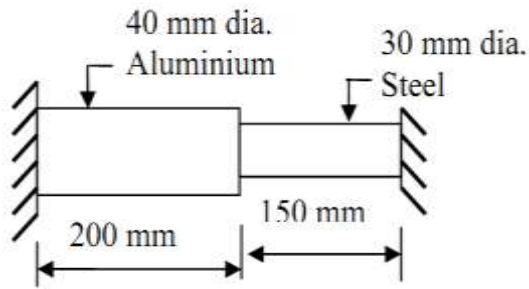


- Q.4 (a) A 4 m long ladder has to carry a person of 75 kg weight at 3.5 m distance from floor, along the length of ladder. The self-weight of ladder is of 150 N. Find the maximum distance of lower end of ladder from vertical wall so that it does not slide. The coefficient of friction between floor and ladder is 0.3 and that between vertical wall and ladder is 0.2. [07]
- (b) Explain parallel axis theorem and perpendicular axis theorem. [07]
- Q.5 (a) Draw variation of shear stress across the cross section of Rectangular, Triangle, T shape, Channel C-shape and I-shape. [07]
- (b) A simply supported beam of span 4.0 m has a cross-section 200 mm × 300 mm. If the permissible stress in the material of the beam is 20 N/mm^2 , determine maximum UDL it can carry. [07]
- Q.6 (a) At a point in a strained material two mutually perpendicular tensile stresses of 420 N/mm^2 and 280 N/mm^2 are acting. There is also a clockwise shear stress of 200 N/mm^2 . Determine the values of principal stresses and location of principal plane. [07]
- (b) Calculate the moment of inertia of the plane area shown in figure below with respect to the axis passing through the base 'AB'. [07]



- Q.7 (a) An assembly made up from Aluminium and Steel bars as shown in the figure below is initially stress free at temperature 32°C . The assembly is heated to bring its temperature to 82°C . Find the stresses developed in each bar. The coefficient of thermal expansions is $1.25 \times 10^{-5}/^\circ\text{C}$ & $2.25 \times 10^{-5}/^\circ\text{C}$ [07]

10⁻⁵ / °C for steel and aluminum respectively. Take $E_s = 200 \text{ GPa}$ & $E_a = 75 \text{ GPa}$.



- (b) Define : (i) Stress (ii) Strain (iii) Bulk Modulus (iv) Poisson's ratio (v) shear stress (vi) Modulus of Elasticity (vii) Moment of Couple.

[07]

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