TED (15/19) 3013
(Revision-2015/19)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, NOVEMBER-2021

THEORY OF STRUCTURES - 1

[Maximum marks: 75] (Time: 2.15 Hours)

PART – A

I (Answer any ***three*** questions in one or two sentences. Each question carries 2 marks)

1. List the various elements of forces.
2. State radius of gyration of a plan section.
3. Define the terms lateral strain and poisson's ratio.
4. Distinguish between circumferential and longitudinal stresses in thin cylinders.
5. State the simple bending equation. (3 x 2 = 6)

PART – B

II (Answer any ***four*** of the following questions. Each question carries 6 marks)

1. A simply supported beam of 5m span is loaded with a concentrated load of 5kN at a distance of 2m from the left support and a Uniformly distributed load of 4 kN/m throughout the span. Determine the support reactions.
2. Sketch the stress strain curve of mild steel with the salient points.
3. Calculate the strain energy per unit volume for a steel bar 20mm diameter and 4m long subjected to a gradually applied load of 50kN. Take E for steel as $2.1 \times 10^5 N/mm^2$.
4. A cantilever beam of 3m is subjected to a load of 20 kN at free end and a uniformly distributed load of 2 kN/m for a distance of 1m from the fixed end. Draw the Shear force diagram for this beam.
5. State the assumptions of pure torsion and write down the torsion equation.
6. State section modulus and find out the section modulus of a rectangular beam of 100 mm wide and 250 mm depth.
7. Write down the equation for shear stress in a beam and draw its variation for a beam of symmetrical 1 section. (4 x 6= 24)

PART – C

(Answer ***any of the three units*** from the following. Each full question carries 15 marks)

UNIT –I

III. (a) A block of weight 100N hangs from a point C by two strings AC and BC as shown in the figure 1.Determine the forces in the strings AC and BC

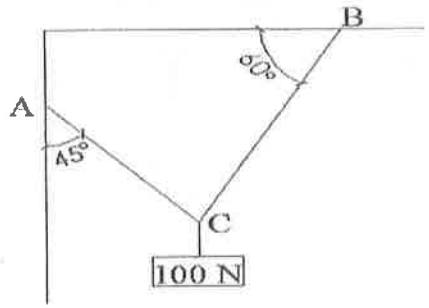

Fig 1 8

(b) Determine the centroid of the T section shown in figure 2 from the base.

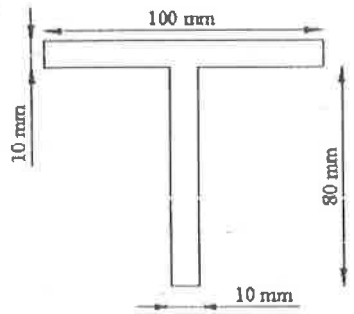

Fig 2 7

OR

IV(a) A simply supported beam of 6 m is loaded with a point load of 20 kN at a distance of 2m form left end and a load of 10 kN at a distance of 3m from the right end. Calculate the moment of force at the centre of the beam. (8)

(b) Find the moment of inertia for 1 section shown in figure 3 about the both centroidal axis. (7)

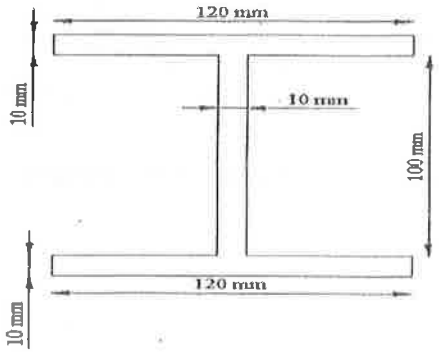

Fig 3

UNIT-II

V(a)A steel rod of 20mm diameter and 2m long is subjected to an axial pull of 10 kN. Determine the Stress, linear strain, lateral strain and linear elongation of the rod. Take E as $2.1 \times 10^5 N/mm^2$ and poisson's Ratio as 0.25. (8)

(b) A prismatic metallic bar of 50 mm diameter and 5m long is subjected to a load of 100 kN applied gradually on it. If the stress at elastic limit is 250 MPa determine the Strain energy and Proof of resilience, Take E = 210 kN/mm^2. (7)

OR

VI. (a) If the Values of Young's modulus of elasticity and poisson's ratio of a material is 200 GPa and 0.25 respectively, determine the Rigidity modulus and Bulk modulus (8)

(b) A bar of 5 m long and 30 mm diameter is subjected to an axial pull of 50 kN. Find the stress, elongation and strain energy if the load is applied suddenly. Take E=200 kN/mm^2 (7)

UNIT-III

VII.(a) Draw the SFD and BMD of a simply supported beam of span 4m with a point load of 15 kN at its centre and a Uniformly distributed load of 5 kN/m over a distance of 2m from the left support. (8)

(b) Find the power transmitted by a circular shaft of 25 mm diameter at 100 R.P.M. The maximum stress in the shaft do not exceed 30 MPa. (7)

OR

VIII.(a) A steel shaft having a modulus of rigidity of 0.8×10^5 N/mm^2 is twisted by 0.5^0 in a length of 1 m. The diameter of the shaft is 20 mm. Determine the torque developed and maximum shear stress developed. (8)

(b) A thin cylinder of 2m diameter and 4m long with a thickness of 20mm is subjected to an internal pressure of 5MPa. Calculate the hoop stress, longitudinal stress and changes in diameter and length. Take E=200 GPa and poisson's Ratio as 0.25. (7)

UNIT-IV

IX. (a) Derive the equation of simple bending and list out any four assumptions used for the derivation. (8)

(b) A rectangular beam 150mm wide and 300mm deep is subjected to a maximum shear force of 30kN. Determine the average shear stress, maximum shear stress and shear stress at distance of 50mm from above the neutral axis and draw its distribution. (7)

OR

X. (a) A timber joist of rectangular section 150 mm x 250mm is fixed at one end and other end free having a length of 4m, what uniformly distributed load it can carry throughout its length, if the maximum bending stress do not exceed $10N/mm^2$. (8)

(b) A circular beam of 50 mm diameter is subjected to a shear force of 10kN. Calculate the values of average and maximum shear stress and sketch the variation of shear stress. (7)

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