S3-CE (2)

TED (10)–3021

(REVISION—2010)

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THIRD SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—MARCH, 2012

THEORY OF STRUCTURES–I

(Common for CE, AR, QS, EN and WR)

[*Time* : 3 hours

(Maximum marks : 100)

PART—A

Marks

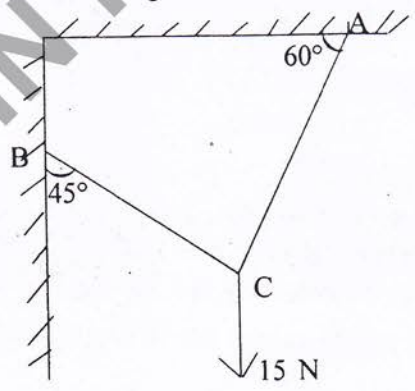
I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. What do you mean by the term 'force' ? What are the conditions of equilibrium of forces ?
2. Define the term centroid. Mark the centroid of a semi circle.
3. Differentiate between 'resilience' and 'modulus of resilience'.
4. Define the terms 'shear force' and 'bending moments'.
5. Differentiate the circumferential and longitudinal stresses. (5×2=10)

PART—B

II Answer *any five* of the following. Each question carries 6 marks.

1. An electric lamp weighing 15 N is hanging from a point 'C' by two strings AC and BC as shown in figure. Determine the tensions in the strings.



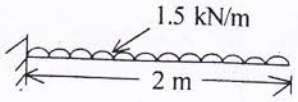
2. A plane is inclined at 15° to the horizontal. If a force of 15N acting parallel to the plane will just prevent a weight of 120 N from sliding down, find the co-efficient of friction.
3. A metal bar 50 mm × 50 mm section is subjected to an axial compressive load of 500 KN. The contraction of a 200 mm gauge length is found to be 0.5 mm and increase in thickness is 0.04 mm. Find the values of Young's modulus and Poisson's ratio.

Marks

4. Find the maximum stress and strain energy stored in a 2 m long and 25 mm diameter bar, when an axial pull of 15 KN is suddenly applied on it. Take E as 100 GPa.

5. A circular shaft 30 mm diameter is subjected a torque of 0.6 KNM. Determine the maximum shear stress developed in the shaft and angle of twist over 1 m length of the shaft. Take $N = 80 \times 10^3$ N/mm^2.

6. Draw the shear force and bending moment diagram of the cantilever beam shown in figure :



7. A solid rectangular column of length 4 m is having a cross section of 200 × 100 mm. If the ends of column are hinged, find Euler's crippling load. Take E = 200kN/mm^2.

(5×6=30)

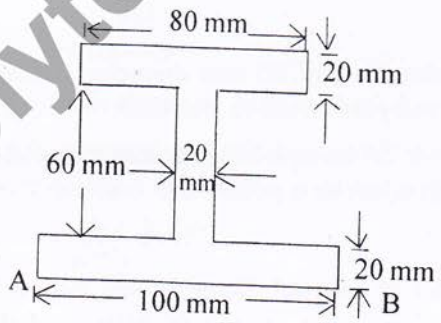
PART—C

(Answer *one* full question from each unit. Each question carries 15 marks.)

UNIT—I

III (a) If two forces acting at a point with an angle 60° between them. If the resultant force is equal to 13.22 N and one force is twice the other force, find the magnitude of each force. 7

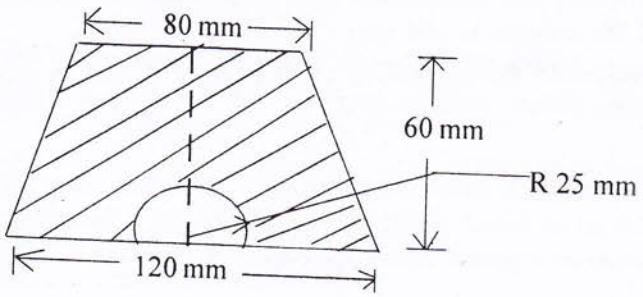
(b) Find the moment of inertia of the I-section shown in figure about an axis passing through its base AB. 8



OR

IV (a) A simply supported beam AB of 6 m span subjected to point loads of 2kN and 4kN at 2 m and 4 m from left support and a uniformly distributed load of 2kN/m on a length of 2 m at its middle span. Calculate the support reactions. 7

(b) Determine the centroid of the lamina shown in figure from its base :



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Marks

UNIT—II

V (a) Sketch the stress strain curve for mild steel and mark the salient features on it. 5

(b) A flat steel bar 200 mm × 20 mm × 8 mm is placed between two aluminium bars 200 mm × 20 mm × 6 mm so as to form a composite bar. Find the stresses in each bar when the temperature of the whole assembly is raised through 50°c. Assume Es = 200 GPa, Ea = 80 GPa, co-efficient of expansion for steel is 12×10^{-6}/ °c and co-efficient of expansion for aluminium is 24×10^{-6}/ °c. 10

OR

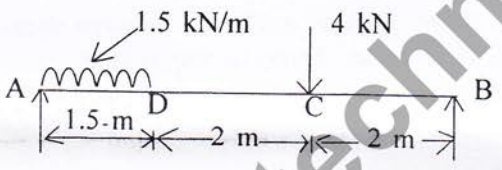
VI (a) A reinforced concrete column 400 × 400 mm in section is reinforced with 4 nos. steel bars of 20 mm diameter. The column carries an axial load of 600 kN. Find the stresses in concrete and steel bars. Take E for concrete as 14 GPa and E for steel as 200 GPa. 8

(b) Derive an equation for strain energy stored in a body when the load is applied gradually. 7

UNIT—III

VII (a) A circular shaft of 60 mm diameter is running at 150 rpm. If the shear stress is not to exceed 60 MPa, find the power which can be transmitted by the shaft. 5

(b) Draw the shear force and bending moment diagrams for the beam shown in figure :



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OR

VIII (a) A solid circular shaft of 80 mm diameter is transmitting 100 kW at 130 r.p.m. Find the intensity of stress in the shaft. 7

(b) Draw the shear force and bending moment diagram for the cantilever beam of 3 m span subjected to a point load 4 kN at 2 m from the fixed end. 8

UNIT—IV

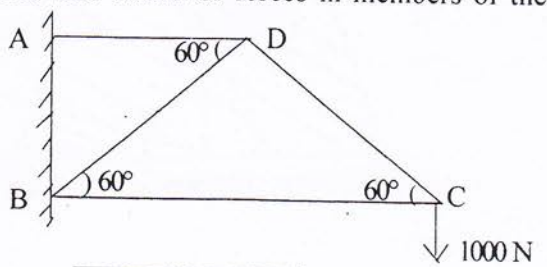
IX (a) A gas cylinder of internal diameter 300 mm is 5 mm thick. If the tensile stress in the material is not to exceed 60 MPa, find the maximum pressure which can be allowed in the cylinder. 5

(b) A steel strut is of 150 mm external diameter and 10 mm thick. H is 3 m long with pin jointed ends. Find the load that can be carried by the column using Rankine's formula. Take the values of fc = 331 N/mm² and $\alpha = \frac{1}{1600}$ 10

OR

X (a) Calculate the slenderness ratio of a column of effective length 2m and diameter of the column is 100 mm. 3

(b) Determine the magnitude and nature of forces in members of the truss shown below :



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