TED (10)–3021

(REVISION—2010)

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THIRD SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—OCTOBER, 2011

THEORY OF STRUCTURES—I

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

[Time: 3 hours

(Maximum marks : 100)

Marks

PART—A

I. Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. What are the conditions of equilibrium ?
2. State the position of centroid of a semi circle.
3. Define poissons ratio.
4. Differentiate between shear force and bending moment.
5. Define slenderness ratio.

(5x2=10)

PART—B

II. Answer any *five* questions. Each question carries 6 marks.

1. A simply supported beam of span 6 m carries a uniformly distributed load of 1.5 kN/m over a length of 3.5 m from the right support in addition to a point load of 2 kN at a distance of 1 m from the left support. Find the support reactions.
2. A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction as 0.3. Find the magnitude of the force, which can move the body, while acting at an angle of 25° with the horizontal.
3. Explain the stress-strain diagram for tension test on mild steel.
4. A steel bar 2 m long 40 mm wide and 20 mm thick is subjected to an axial pull of 160 kN in the direction of its length. Find the changes in length, width and thickness of the bar. Take E = 200 GPa and poissons ratio = 0.3.
5. Draw the shear force and bending moment diagram of a cantilever with a point load at the free end.
6. A steam boiler of 800 mm diameter is made up of 10 mm thick plates. If the boiler is subjected to an internal pressure of 2.5 MPa, find the circumferential and the longitudinal stresses induced in the boiler plates.
7. Discuss the equivalent length of a column under different end conditions.

(5x6=30)

Marks

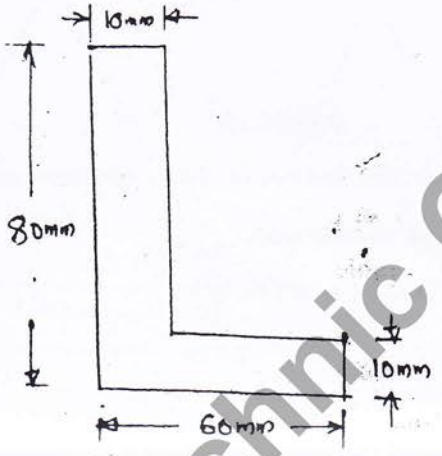
PART—C

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

UNIT – I

III (a) Two forces of magnitude 10N and 8N acting at a point. If the angle between the two forces is 60°, determine the magnitude of the resultant force. 3

(b) Find the moment of inertia of the 'L' Section as shown in figure about the centroidal xx and yy axis.



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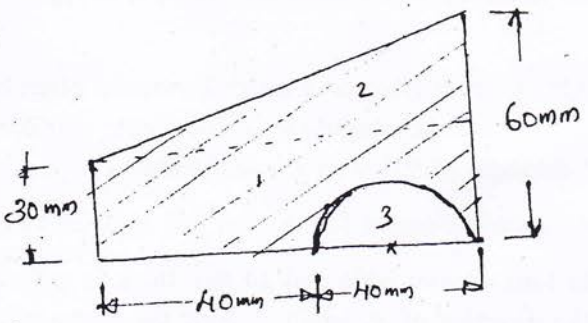
OR

IV (a) A body weighing 2500 N is suspended from a ceiling by two strings making angles of 30° and 60° with the ceiling. Find the tension in the strings. 3

(b) A semi circular area is removed from a trapezium as shown in figure. Determine the centroid of the remaining area.



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UNIT – II

V (a) A reinforced concrete column of 40 cm diameter supports a load of 500 kN axially. The reinforcement consists of 8 steel rods each of 20 mm diameter. Find how much load is carried by the rods and the concrete, if youngs modulus of steel is 15 times that of concrete. 9

(b) An axial pull of 20 kN is suddenly applied on a steel rod 2.5 m long and 1000 mm^2 in cross section. Calculate the strain energy which can be absorbed in the rod. Take E = 200 GPa. 6

OR

Marks

VI (a) A prismatic metallic bar of rectangular section 500 mm x 200 mm and 12 m long is subjected to a load of 150 kN applied gradually on it. If the stress at elastic limit of the bar material is 200 N/mm², determine :

(i) Strain energy at the given load.

(ii) Proof resilience

(iii) Modulus of resilience

Take E = 200 kN/mm². 10

(b) If the values of modulus of elasticity and poissons ratio for an alloy body is 150 GPa and 0.25 respectively, determine the value of bulk modulus for the alloy. 5

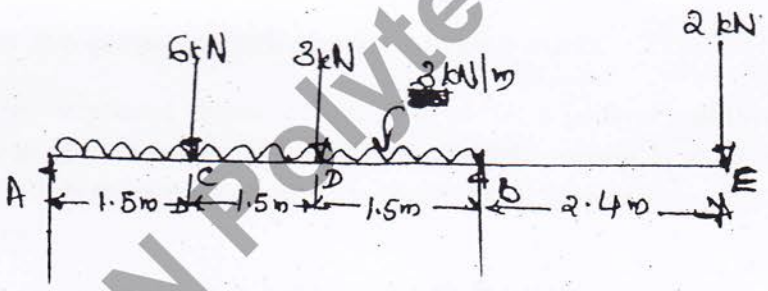
UNIT – III

VII (a) Derive the torsion equation for a circular solid shaft. 8

(b) Draw the SF and BM diagram of a cantilever of length 6 m with point loads 2 kN, 4kN and 3kN acting at a distance 2m, 4m and 6 m respectively from the left support. 7

OR

VIII Sketch the SF and BM diagram of the beam as shown in figure also find the maximum BM values and point of contraflexure.



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UNIT – IV

IX (a) A column 12m long has a section 1m square. The column is made of a metal having modulus of elasticity as 2×10^5 N/mm². Use Eulers formula to determine the buckling load if :

(i) Both ends of the column are pinned.

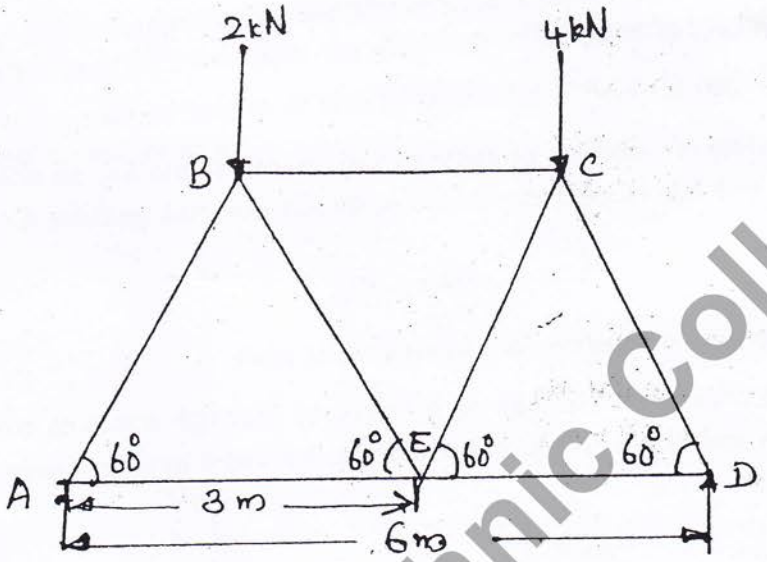
(ii) One end is fixed and the other end of the column is free. 10

(b) A thin cylindrical wall of 400 mm diameter is to be designed for an internal pressure of 2.4 MPa. Find the suitable thickness of the wall, if the allowable compressive stress is 50 MPa. 5

OR

Marks

X Compute the forces in all members of a truss as shown in figure. Also tabulate the results and state the nature of forces.



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