TED (10)–3021 Reg. No. .....

(REVISION—2010) Signature .....

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

THEORY OF STRUCTURES—I

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

[*Time* : 3 hours

(Maximum marks : 100)

Marks

PART—A

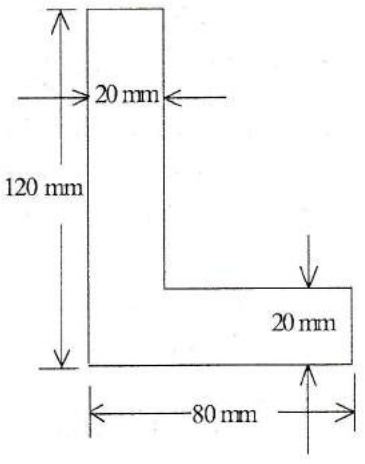
I Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. Define the term 'Radius of gyration'.
2. What are the different methods of application of loads ?
3. Write the relationship between Load, SF and BM.
4. What are the different types of beams ?
5. Define the term 'Slenderness ratio'of a column. (5x2=10)

PART—B

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

1. Determine the centre of gravity of the lamina shown in figure :



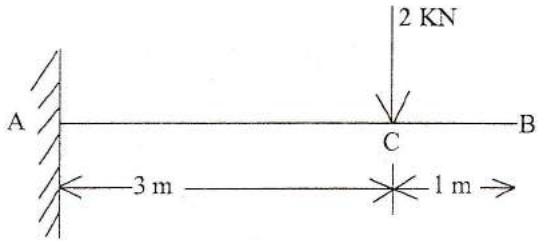
2. Find the polar moment of inertia of a circular shaft of internal diameter 30 mm and external diameter 50 mm.
3. A steel bar 2 m long 40 mm wide and 20 mm thick is subjected to an axial pull of 160 KN in the direction of its length. Find the changes in length, width and thickness of bar. Take E = 200 Gpa and Poisson's ratio = 0.3.

Marks

4. A brass rod is 2 m long fixed at its both ends. If the thermal stress is not to exceed 76.5 Mpa, calculate the temperature through which the rod should be heated. Take the value of α and E as 17 x 10^{-6}/°C and 90 Gpa respectively.

5. A solid circular shaft of steel is subjected to a torque of 50 KNm and the shear stress is not to exceed 80 N/mm^2. Find the diameter for the shaft.

6. Draw SFD and BMD of the cantilever beam shown below :



7. A thin cylindrical shell of 4 m diameter and 40 mm thick subjected to an internal fluid pressure of 1N/mm^2. Calculate the longitudinal and hoop stresses in the material of shell. (5x6=30)

PART—C

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

Unit – I

III (a) A simply supported beam of length 8 m carries a uniformly distributed load of 3 KN/m for a length of 3 m from left end and two point loads of 4 KN and 6 KN at 4 m and 6 m from left support. Find the support reactions. 7

(b) Find the centre of gravity of a solid consisting a cylinder surmounted by a hemisphere at its top. The diameter of cylinder and hemisphere is 80 mm and height of cylinder is 120 mm. 8

Or

IV (a) Find the moment of inertia of a hollow rectangular section about the axes passing through its C.G., if the external dimensions are 40 mm deep and 30 mm wide and internal dimensions are 25 mm deep and 15 mm wide. 8

(b) A force of 40 N pulls a weight of 60 N up an inclined plane, the force being applied parallel to the plane. If the inclination of the plane is 30°, find the co-efficient of friction. 7

Unit – II

V (a) Explain any four mechanical properties of material. 8

(b) An axial pull of 15 KN is suddenly applied on a steel rod 2 m long and 1000 mm^2 in cross section. Calculate the Strain Energy which can be absorbed in the rod. Take E = 200 Gpa. 7

Or

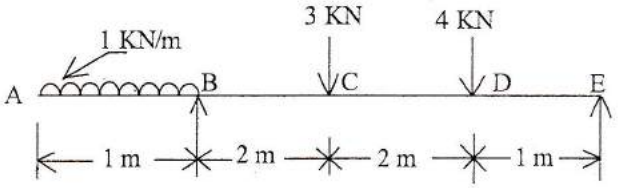
VI (a) A bar of 30 mm diameter is subjected to a pull of 80 KN. The measured extension on a gauge length of 200 mm is 0.12 mm and the change in diameter is 0.004 mm. Calculate Poisson's ratio and the value of the three moduli. 12

(b) An aluminium alloy bar, fixed at its both ends is heated through 20°C. Find the stress developed in the bar. The modulus of elasticity and co-efficient of linear expansion of the bar material as 80 Gpa and 24 x 10^{-6}/°C respectively. 3

Marks

UNIT – III

VII A beam ABCD 6 m long is overhanging by 1 m at left end and carries loads as shown in figure. Draw the shear force and bending moment diagrams for the beam indicating the max. BM values. Locate the point of contraflexure.



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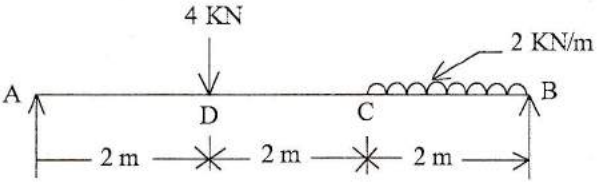
OR

VIII (a) A hollow shaft of external diameter 120 mm transmits 300 KW power at 200 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60 N/mm^2. 8

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



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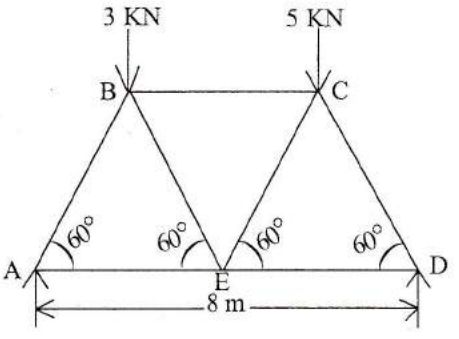
UNIT – IV

IX (a) A cylindrical vessel of 400 mm in diameter with 10 mm thick plates is subjected to an internal pressure of 2.5 Mpa. Calculate the circumferential and longitudinal stresses induced in the plates. 6

(b) A hollow alloy tube 4 m long has external and internal diameters, 40 mm and 25 mm respectively. Find Euler's buckling load for the tube when both ends are pinned. Take E as 70 x 10^3 N/mm^2. 9

OR

X The frame shown in figure consists of seven members of 4 m length, freely supported at its end points. Find the forces in each members of the truss.



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