TED (06)–3017

(REVISION—2006)

Reg. No. .....

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THIRD SEMESTER DIPLOMA EXAMINATION IN TECHNOLOGY

MARCH, 2011

APPLIED MECHANICS AND STRENGTH OF MATERIALS

(Common for ME, TD and WP)

[*Time* : 3 hours

(Maximum marks : 75)

PART—A

(Maximum marks : 15)

Marks

I Answer the following questions in one or two sentences :

1. Define lateral strain.
2. Define stress and strain.
3. What is limiting friction ?
4. Define centre of gravity and centroid.
5. State the expression for hoop stress.
6. Define torsional stiffness.
7. What is point of contraflexure ?
8. What is simple bending ?
9. Define slenderness ratio.
10. Define column and strut.

(10×1½=15)

PART—B

(Maximum marks : 60)

(Answer *one* full question from each unit)

UNIT—I

II (a) Explain :

(i) Longitudinal stress. (iii) Tensile stress

(ii) Compressive stress. (iv) Shear stress. 6

(b) A steel rod 30 mm diameter and 5 m long is connected to two grips and the rod is maintained at a temperature of 95°C. Determine the stress and pull exerted when the temperature falls to 30°C, if :

(i) the ends do not yield.

(ii) the ends yield by 1.2 mm

Take $E = 2 \times 10^5$ N/mm^2 and $\alpha = 12 \times 10^{-6}$ °C. 6

OR

Marks

III (a) Explain the terms :

(i) Bulk modulus (ii) Poisson's ratio (iii) Modulus of rigidity. 6

(b) A bar of 30 mm diameter is subjected to a pull of 60 KN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Calculate :

(i) Young's modulus (ii) Poisson's ratio (iii) Bulk modulus. 6

UNIT—II

IV (a) State the laws of kinetic friction. 6

(b) Determine the moment of inertia of I section about XX axis is made up of top flange 80 mm x 12 mm and web 128 mm x 12 mm and bottom flange 120 mm x 10 mm. 6

OR

V (a) An effort of 200 N is required just to move a certain body up an inclined plane of 15°, the force acting parallel to the plane. If the angle of inclination of the plane is made 20° the effort required, again applied parallel to the plane, is found to be 230 N. Find the weight of the body and co-efficient of friction. 8

(b) (i) State theorem of perpendicular axis.

(ii) Radius of gyration. 4

UNIT—III

VI (a) A solid steel shaft of 60 mm diameter is to be replaced by a hollow steel shaft with internal diameter equal to half of the external diameter. Find the diameters of hollow shaft and saving of the materials. The maximum allowable shear stress is same for both shafts. 6

(b) Explain different types of welded joints with sketches. 6

OR

VII (a) A boiler shell is to be made of 12 mm thick plate having limiting tensile stress of 100 N/mm^2. If the efficiencies of longitudinal and circumferential joints are 75% and 35% respectively, determine the maximum permissible diameter of the shell to withstand a steam pressure of 1.2 N/mm^2. 6

(b) A leaf spring is to be made of seven steel plates 65 mm wide and 6.5 mm thick. Calculate the length of spring so that it may carry a central load of 2.75 KN. The bending stress being limited to 160 MPa, also calculate the deflection at the centre of the spring. Take E for spring materials as 200 GPa. 6

UNIT—IV

VIII (a) Explain with simple sketch express different kinds of beam. 6

(b) A cantilever of square cross-section 200 x 200 mm is 2 m long. It just fails when a load of 10 KN is placed at its free end. A beam of same material and having the rectangular cross-section 150 mm x 300 mm is simply supported over a span of 3 m. Calculate the central load required to break the beam. 6

OR

Marks

IX (a) A timber beam of rectangular section is to support a load of 20 KN uniformly distributed over a span of 3.6 m when the beam is simply supported. If the depth of the section is to be twice the breadth and the stress in the timber is not exceed 7 N/mm^2, find the dimensions of the cross-section. 6

(b) A cantilever 2 m length carries point loads of 300 N, 500 N and 800 N are acting at a distance 0.5 m, 1.2 m and 2 m respectively from the fixed end. Draw the shear force and bending moment diagram for the cantilever. 6

UNIT—V

X (a) What are the assumptions of Euler's theory of long column ? 4

(b) A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a uniformly distributed load of 9 KN/m run over the entire span of 5 m. If the value of E for the beam material is 1×10^7 N/mm^2;

Find (i) Slope at support.

(ii) Maximum deflection. 8

OR

XI (a) A hollow alloy tube 4 m long with external and internal diameters of 40 mm and 25 mm respectively was found to extend 4.8 mm under a tensile load of 60 KN. Find the buckling load for the tube with both ends hinged. Also find the safe load on the tube, taking factor of safety as 5. 6

(b) A timber beam 150 mm x 300 mm cross-section supports a central point load on a span of 4 m. If the maximum bending stress is 8 N/mm^2, what is the maximum deflection ? Take E = 0.1×10^5 N/mm^2. 6