TED (10)–4017 Reg. No. .....

(REVISION—2010) Signature .....

# FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—MARCH, 2014

## APPLIED MECHANICS AND STRENGTH OF MATERIALS

(Common to ME, TD and WP)

[*Time* : 3 hours

(Maximum marks : 100)

## PART—A

(Maximum marks : 10)

Marks

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

1. Define coefficient of linear expansion.
2. What is angle of friction ?
3. Define hoop stress.
4. What is meant by solid length ?
5. Explain slenderness ratio. (5×2=10)

## PART—B

(Maximum marks : 30)

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

1. A circular bar of 25 mm diameter and 300 mm long extends 0.5 mm under a load of 50 KN. Find the :
   (i) The stress (ii) The modulus of elasticity (iii) strain
2. An aluminium alloy bar, fixed at its both ends is heated through 20 K. Find the stress developed in the bar. Take modulus of elasticity and coefficient of linear expansion of the material as 80 GPa and $24 \times 10^{-6}$/K respectively.
3. A force of 300 N pulls a body of weight 500 N along a horizontal plane, the force being applied at an angle of 15° to the horizontal. Find the coefficient of friction.
4. State and explain the theorem of perpendicular axis as applied to moment of inertia.
5. A gas cylinder of internal diameter 50 mm is 6 mm thick. If the tensile stress is not to exceed 30 MPa. Find the maximum pressure which can be allowed in the cylinder.
6. Explain the most common types of beams.
7. Write the relation for the Rankine's crippling load for columns. Explain each terms. (5×6=30)

Marks

PART—C

(Maximum marks : 60)

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

UNIT—I

III (a) State Hook's law also explain young's modulus. 7

(b) A hollow cylinder 2.5 m long has an outside diameter of 50 mm and inside diameter of 25 mm. If the cylinder is carrying a load of 30KN. Find the stress in the cylinder. Also find the deformation of the cylinder. If the modulus of elasticity is 100 GPa. 8

OR

IV (a) Define stress, strain and modulus of elasticity. 7

(b) A copper bar is 1000 mm long and circular in section. It consists of 200 mm long bar of 50 mm diameter, 500 mm long bar of 20 mm diameter and 300 mm long bar of 30 mm diameter. If the bar is subjected to an axial load of 50KN. Find the total extension of the bar. Take E for the material as 100 GPa. 8

UNIT—II

V (a) State the laws of static friction. 7

(b) An I section has the following dimensions in mm :
Bottom flange : 300 × 50, Top flange : 150 × 50, Web 300 × 50
Determine mathematically the position of centre of gravity of the section. 8

OR

VI (a) Distinguish between centre of gravity and centroid. 7

(b) Calculate the moment of inertia of an I section having equal flanges 30 mm × 10 mm and web also 30 mm × 10 mm about an axis passing through its centre of gravity parallel to X-X and Y-Y axis. 8

UNIT—III

VII (a) Distinguish between the strength of riveted joint and efficiency of riveted joint. 7

(b) Two plates of 12 mm thick are joined by a double riveted lap joint. The diameter of rivet is 16 mm and pitch is 80 mm. If ft = 120N/mm$^2$, fs = 90N/mm$^2$ and fb = 150 N/mm$^2$. Determine the efficiency of the riveted joint. 8

OR

VIII (a) Give the advantages and disadvantages of welded joints. 7

(b) A hollow shaft of external and internal diameters of 60 mm and 40 mm is transmitting torque. Find the torque it can transmit. If the shear stress is not to exceed 40 MPa. 8

Marks

UNIT—IV

IX (a) Define :

(i) Equivalent length (ii) Buckling load 7

(b) A mild steel column of 50 mm diameter is hinged at both ends. Find the crippling load for the column, if its length is 2.5 m. Take E for the column material as 200 GPa. 8

OR

X (a) Define :

(i) Point of contra flexure (ii) Flexural rigidity 7

(b) A simply supported beam of 3 m span carries two loads of 5KN each at 1 m and 2 m from the left hand support. Draw the shear force and bending moment diagrams for the beam. 8