DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2017

APPLIED MECHANICS AND STRENGTH OF MATERIALS

[*Time* : 3 hours

(Maximum marks : 100)

Marks

PART — A

(Maximum marks : 10)

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

1.   Define Modulus of rigidity.

2.   Define Coefficient of friction.

3.   List any 4 types of welded joints.

4.   Define the term Spring index.

5.   Define Bending moment.

(5×2 = 10)

PART — B

(Maximum marks : 30)

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

1.   A steel rod 20 mm diameter, 400 mm long is subjected to an axial pull of 40 kN. Determine the elongation of the rod, if $E = 2 \times 10^5$ N/mm^2.

2.   Draw the stress - strain diagram for mild steel and show the salient points.

3.   A body weighing 540 N is pulled along a rough horizontal plane by a force of 180 N acting at an angle of 30° with the horizontal.

   (a)   Draw the diagram indicating all the forces.

   (b)   Find the Normal reaction.

   (c)   Find coefficient of Friction.

4.   Explain :

   (a) Moment of inertia   (b)   Radius of Gyration

[35]

5. Two Plates of 100 mm width connected by fillet weld of 8 mm size as shown in Figure. If the maximum permissible stress in the weld material is 102.5 N/mm², find the strength of Joint.
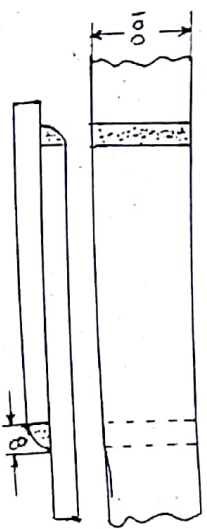
6. Explain :

   (a) Hoop stress   (b) Longitudinal stress in thin cylinders

7. Define the following :

   (a) Column   (b) Strut

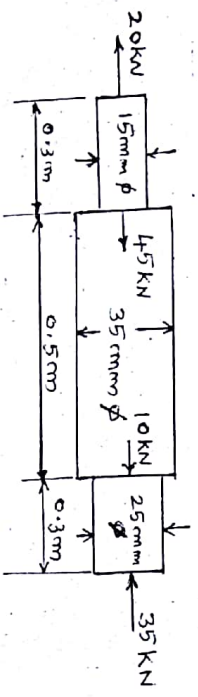   (c) slenderness ratio   (d) Buckling load   (5×6 = 30)

PART — C

(Maximum marks : 60)

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

Unit — I

III (a) A bar of varying cross section is loaded as shown in figure. Determine :

   (i) Stress in each section   (ii) Total elongation

   Take E = 2× 10⁵ N/mm².   10

Or

(b) Find the temperature stress induced in a bar when it is totally prevented from expansion.   5

IV (a) A steel rod of 20m length at a temperature of 25°C is heated to 75°C. Modulus of elasticity of steel is 2 ×10⁵ N/mm² and temperature coefficient of expansion is 12 × 10⁻⁶ per °C. Find

   (i) Thermal stress induced when expansion is completely prevented.

   (ii) Total expansion prevented.   10

(b) State the following :

   (i) Lateral strain   (ii) Poison's ratio   (iii) Factor of safety   5

Unit — II

V (a) (i) Find the position of centroid of the section shown in figure.

   (ii) Find the Moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section.   10

All dimensions are in mm
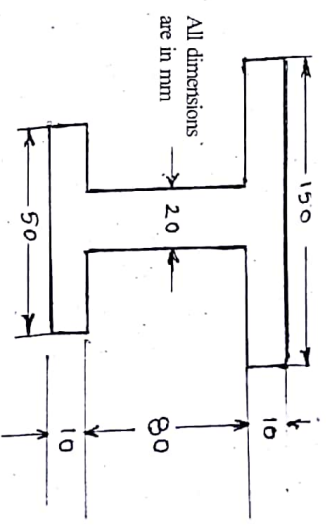
(b) State the laws of solid friction.   5

Or

VI (a) Derive an expression to find the force required to move the body up, when the body resting on an inclined plane and force acting horizontally.   10

(b) State :

   (i) Parallel axis theorem   (ii) Perpendicular axis theorem   5

Unit — III

VII (a) A hollow shaft is to transmit 200 kW at 80 rpm.

   (i) Find the torque Transmitted.

   (ii) If the allowable shear stress is not to exceed 60 MPa and internal diameter is 0.6 of the external diameter, find the diameter of the shaft.   10

(b) Illustrate and explain the process and procedure of caulking and fullering.   5

Or

Marks

VIII (a) A boiler shell is to be made of 12 mm thick plate having limiting tensile stress of 100 N/mm². Determine the maximum permissible diameter of the shell to withstand a steam pressure of 1.2 N/mm². When

   (i) · Efficiency of longitudinal joint is 75%.

   (ii) Efficiency of Circumferential joint is 35%.   10

  (b) Make a comparison between Reverted joint and Welded joint.   5

UNIT — IV

IX (a) Draw the shear force and Bending Moment diagrams for the system of forces shown below :
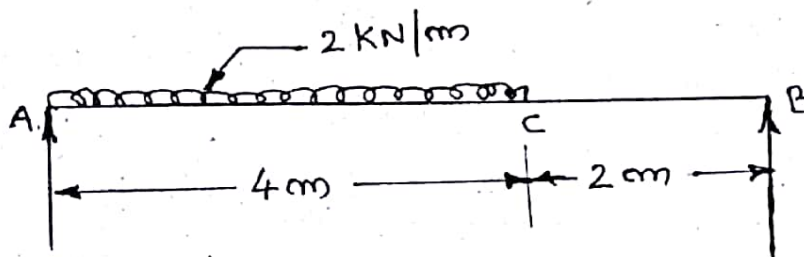
                                                             10

  (b) State :

  (i) Euler's formula   (ii) Rankine's formula for columns   5

<div align="center">OR</div>

X (a) Find the crippling load by Rankine's formula for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of column as 2.3 meter and hinged at it's both ends. Taking crushing stress of the column material as 335 MPa and Rankine's constant as 1/7500.   10

  (b) (i) Classify Different types of Beams.

     (ii) Classify different types of loads on Beams.   5