TED (10) 3021
(Revision - 2010)

N20 – R01921

Reg. No........................
Signature ....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2020

THEORY OF STRUCTURES - I

[Maximum Marks: 100] [Time: 3 Hours]

PART-A

[Maximum Marks: 10]
(Answer *all* questions in one or two sentences. Each question carries 2 marks)

I. 1. Define (i) Centre of gravity of a body and (ii) Centre of a lamina.

2. Define Proof resilience.

3. Define the term Pure Torsion.

4. Define Circumferential stress or Hoop stress in case of a thin cylindrical shell.

5. What is the difference between Strut and Column? (5 x 2 = 10)

PART-B

[Maximum Marks: 30]
(Answer any *five* of the following questions. Each question carries *6* marks)

II 1. Calculate the moment of inertia of the section about an axis through C.G. and parallel to base as shown in figure (1).

2. (i) What do you mean by Principle of Superposition? (ii) State Hooke's Law.

3. Define the following in case of a loaded beam.
(a) Bending moment (b) Shear force (c) Point of Contraflexure.

4. (i) Define the term Slenderness ratio (ii) What is meant by effective length of a column?.

5. Find the torque which a shaft of 100 mm diameter can transmit safely, if shear stress is not to exceed 100 N/mm^2.

6. Define the following mechanical properties of materials.
(i) Elasticity (ii) Plasticity and (iii) Ductility.

7. Define the following terms.
(i) Perfect frame (ii) Imperfect frames and (iii) Redundant frames. (5 x 6 = 30)

PART-C

[Maximum Marks: 60]
(Answer *one* full question from each Unit. Each full question carries 15 marks)

UNIT – I

III (a) Explain the different types of friction. (6)

(b) A body of weight 500 N is pulled upon an inclined plane by a force of 350N. The inclination of the plane is 30^0 to the horizontal and the force is applied parallel to the plane. Determine the coefficient of friction. Figure (2). (9)

OR

IV (a) A Simply supported beam of span 9 m carries the uniformly varying load from O at the end A to 900N/m at the end B. Calculate the reactions at the two ends of the support, Figure (3). (6)

(b) A body consists of a right circular solid cone of height 40 mm and radius 30 mm placed on a solid hemisphere of radius 30 mm of the same material. Find the position of the C.G. of the body (dimensions in mm), Figure (4). (9)

UNIT – II

V (a) An axial pull of 20 kN is suddenly applied on a steel rod 2.5 m long and 1000 mm^2 cross section. Calculate the Strain Energy which can be absorbed in the rod. Take E = 200 GPa. (7)

(b) A steel rod of length 4m and diameter 20 mm is being stayed between two plates at a temperature of 60^0C. Find out the force exerted by the rod after it has been cooled to 20^0C.

(i) If the plates do not yield and

(ii) If the total yield at the two ends 1 mm.

Take $E_s = 2 \times 10^6$ kg/cm^2; $\alpha_s = 12 \times 10^{-6} / {}^0C$. (8)

OR

VI (a) A bar 4m long and 100 mm X 200 mm in section is subjected to a pull of 50 kN. If Young's modulus of the material of the bar is 200 kN/mm2, find

(i) The stress setup in the bar material (ii) Strain produced

(iii) Elongation of the bar and (iv) Work done. (8)

(b) Define the following terms:

(i) Bulk Modulus (ii) Volumetric Strain (iii) Poisson's ratio (3 + 2 + 2 = 7)

UNIT- III

VII (a) A simply supported beam AB of span 'l' carrying a uniformly distributed load W/unit length. Draw the SF and BM diagrams for the beam and also calculate the maximum BM on the beam. (7)

(b) A Cantilever beam of 2.5 m span is loaded as shown in Figure (5). Draw the shear force and bending moment diagrams. (8)

OR

VIII (a) Write down the Torsional equation for hollow circular shaft. (7)

(b) A Cantilever beam 4m long carries a uniformly varying load zero at the free end and to 1000kN/m at the fixed end. Draw BM and SF diagrams for the beam. (8)

UNIT - IV

IX (a) Define Safe load or Working load of a Column. (5)

(b) The truss ABC shown in figure (6) has a span of 10 m. It is carrying a load of 10kN at its apex. Find the forces in the members AB, BC and AC by Method of Joints. (10)

OR

X (a) Write down Rankine's formula applicable for Columns ranging from very long to short ones. (5)

(b) A Column 12m long has a section 1m square. The Column is made of a metal having modulus of elasticity as 2 X 10^4 KN/cm2. Use Euler's formula to determine the buckling load if (i) both ends of the column are pinned and (ii) one end is fixed and the other end of the column is free. (10)

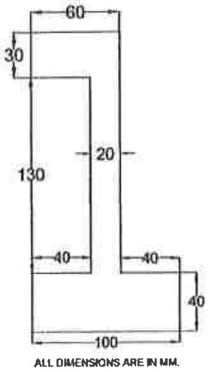

Figure (1)

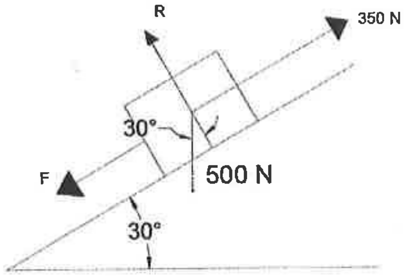

Figure (2)

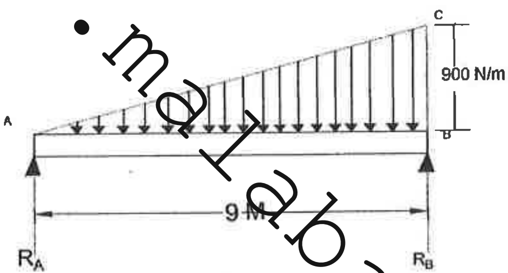

Figure (3)

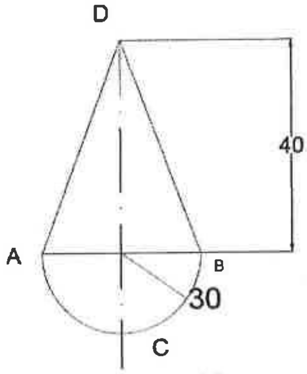

Figure (4)

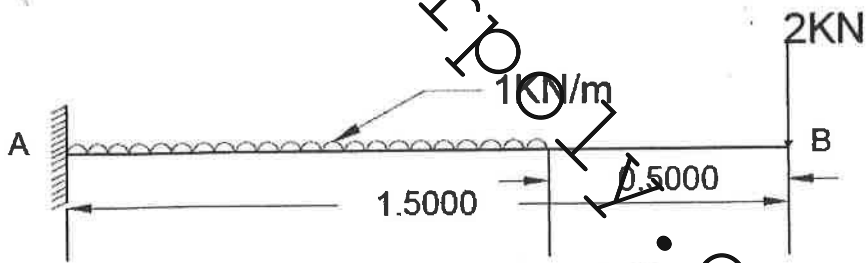

Figure (5)

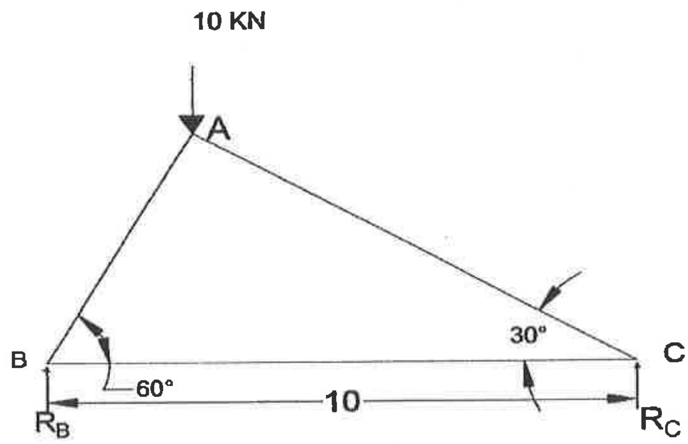

Figure (6)