TED (15) – 3013

(REVISION — 2015)

Reg. No.....

Signature .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2018

THEORY OF STRUCTURES - I

[*Time* : 3 hours

(Maximum marks : 100)

[*Note* :—Sketches on 4th page.]

PART — A

(Maximum marks : 10)

Marks

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

1. Define a force.
2. What do you mean by factor of safety ?
3. Define the term neutral layer of a section.
4. Classify the types of loading on the beam.
5. Define moment of resistance of a section in a beam. (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Two forces 80 N and 70 N acts simultaneously act at a point O with angle between them is 90°. Find the magnitude and direction of resultant of force.
2. A simply supported beam AB of span 4 meter carries three point loads of 4 kN, 10 kN and 8 kN at a distance 1m, 2m and 3m respectively from the left hand support. Calculate the support reactions.
3. A member formed by connecting a steel bar to an aluminium bar of cross sectional area 2500 mm^2 is shown in the figure -1. Calculate the magnitude of the load P which will cause the total length of the member to decrease 0.25 mm. Take E for steel = 2.1×10^5 N/mm^2 and E for aluminium = 7×10^4 N/mm^2.
4. Explain resilience, proof resilience and modulus of resilience.
5. A cantilever beam 3 meter long carries UDL of 2 kN/m over the entire span and a point load of 3kN at the free end. Draw the shear force and bending moment diagram.

Marks

6. A shaft has to transmit power of 105 kW at 160 rpm. If the shear stress is not to exceed 65N/mm², and the twist in a length of 3.5 meter must not exceed 1°, find a suitable diameter. Take C = 8 ×10⁴ N/mm².

7. Write the assumptions made in the theory of simple bending. (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 simply supported beam PQ of span 5 meter carries three point loads of 5 kN, and 10 kN at a distance 2m and 4m respectively from the left hand support. In addition to this a udl of 2kN/m over the entire span. Calculate the support reactions. 7

(b) Find the position of center of gravity of L section shown in figure - 2. 8

OR

IV (a) A weight of 15 N hangs on two chains as shown in figure - 3. Determine the tension in each chain. 6

(b) Find the moment of inertia of T section about x-x axis is shown in figure - 4. 9

UNIT — II

V (a) A load of 300 kN is applied on a short column 250 mm × 250 mm. The column is reinforced by steel bars of total area 5600 mm². If modulus of elasticity for steel is 15 times that of concrete, find the stresses in steel and concrete. 7

(b) Explain mechanical properties of material. 8

OR

VI (a) Draw and explain the salient features of stress strain curve of a mild steel bar. 8

(b) A steel bar 4 meter long, 35 mm wide and 20 mm thick is subjected to a pull of 30 kN in the direction of its length. Find the change in volume of bar, if poisson's ratio is 0.25. Take E = 200 GPa. 7

UNIT — III

VII (a) Classify the types of beam depending on the type of supports. 5

(b) A simply supported beam of 10 m long carries a UDL 2 kN/m over entire length and point loads 1 kN and 2 kN at distance 2m and 5m from the left support. Draw shear force and bending moment diagram. 10

OR

Marks

VIII (a) Find the maximum torque, that can be transmitted safely to a shaft of diameter 30 cm diameter. The permissible angle of twist is 1.5 degree in a length of 8.0 meter length and the shear stress is not to exceed 40 N/mm². Take C = 8 × 104 N/mm². 7

(b) The vessel of 530 mm external diameter and 10 mm thick, the length being 1800 mm. Find the change in external diameter and the length when the internal pressure of 10.5 N/mm². Take E = 2.1 × 105 N/mm² and Poisson's ratio of 0.3. 8

UNIT — IV

IX (a) Derive the equation of simple bending. 9

(b) An I section has the following dimensions : Flanges 150 mm × 20 mm, web 300 mm × 10 mm. Find the maximum shear stress developed in the beam for a shear force of 50 kN. 6

OR

X (a) A rolled steel joist of I section has the following dimensions : Flange width 250 mm wide and 24 mm thick, Web 12 mm thick, Overall depth 600 mm. If this beam carries a UDL of 50 kN per meter run on a span of 8 meters, calculate the maximum stress produced due to bending. 6

(b) A beam of 100 mm × 150 mm in size is simply supported at its ends carries UDL over the span of 2 meter. If the safe stress are 28 N/mm² in bending and 2 N/mm² in shear. Calculate the safe load which can be supported by the beam. 9

Marks

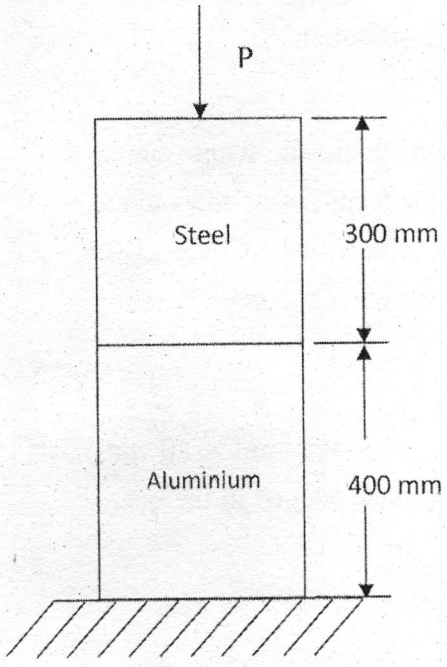

Figure -1

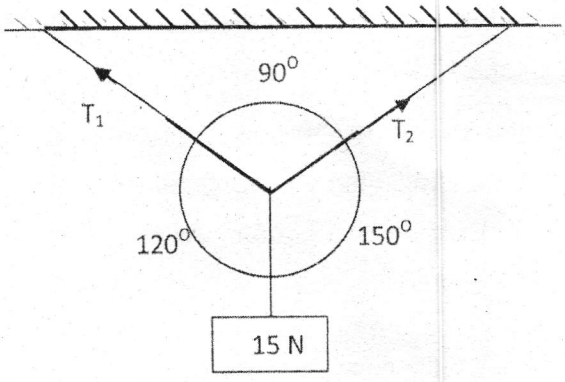

Figure -3

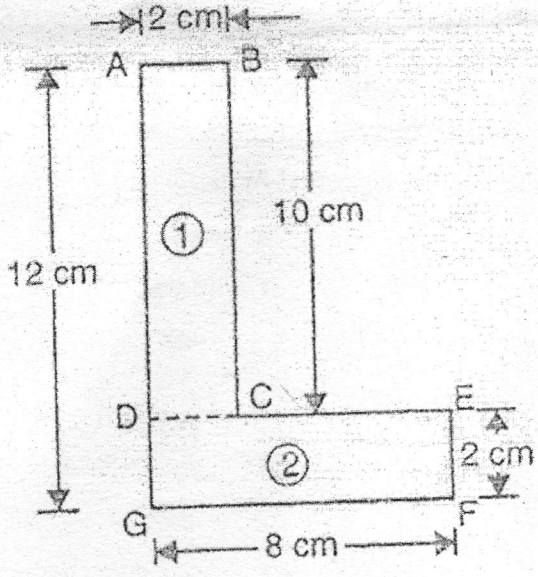

Figure -2

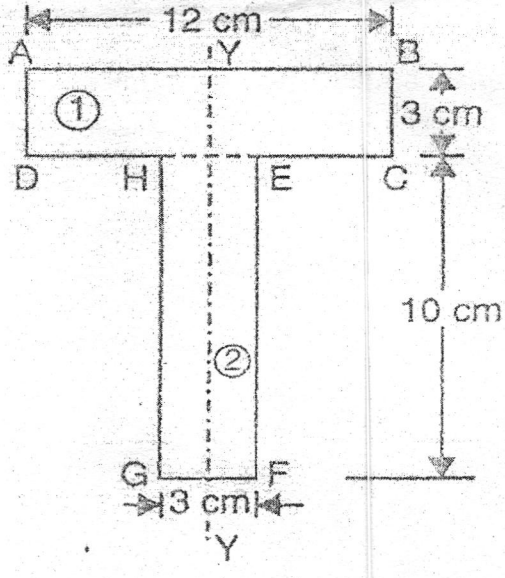

Figure -4