TED (15) – 3013 Reg. No. .....

(REVISION — 2015) Signature .....

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

THEORY OF STRUCTURES - I

[*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. List any two elements of force.
2. State clearly the Hooke's law.
3. Define Resilience.
4. List any four type of beams.
5. Write down the bending equation. (5 × 2 = 10)

PART — B

(Maximum marks : 30)

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

1. Explain any three system of forces with neat sketch.
2. A steel rod of 30mm diameter and 5m length is subjected to an axial pull of 40KN. Find the stress, strain and elongation of the rod. Take E = 2×10^5 N/mm^2.
3. Explain any four mechanical properties of a metals.
4. A cantilever beam 2m long carries a point load of 1.8KN at its free end. Draw shear force diagram and bending moment diagram.
5. A circular shaft 30mm diameter is subjected a torque of 6KNm. Calculate the maximum shear stress developed in the shaft.

Marks

6. A beam 3m long has rectangular section of 80mm width and 120mm depth, if the beam is carrying a uniformly distributed load of 10KN/m. Find the maximum bending stress developed in the beam.

7. A rectangular beam 80mm wide and 150mm deep is subjected to a shearing force of 30KN. Calculate the maximum shear stress and draw the distribution diagram for the shear stress. $(5 \times 6 = 30)$

PART — C

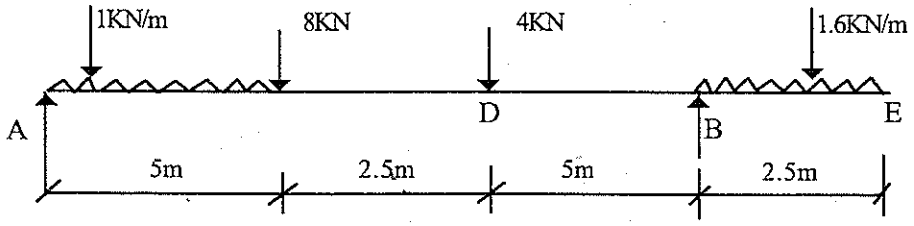
(Maximum marks : 60)

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

UNIT — I

III (a) Find the centre of gravity of a 'T' section with flange 150mm × 10mm and web also 150mm × 10mm. 8

(b) An overhanging beam as shown in figure. Calculate the support reactions.

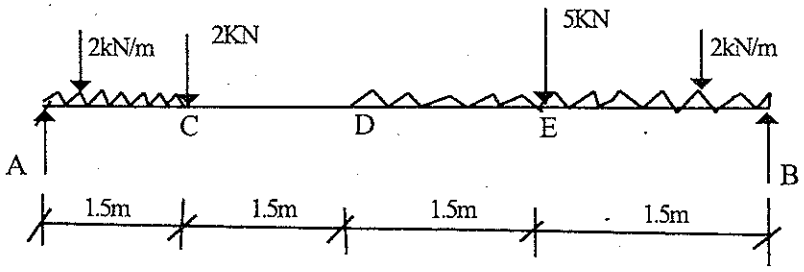


7

OR

IV (a) A body consists of a right circular solid cone of height 50mm and radius 40mm placed on a solid hemisphere of radius 40mm of the same material. Find the position of centre of gravity of the body. 8

(b) A simply supported beam AB as shown in figure. Calculate the support reactions.



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UNIT — II

V (a) A concrete column of 350mm diameter is reinforced with 4 bars of 25mm diameter. Find the stress in steel when the concrete is subjected to a stress of 4.5MPa. Also find the safe load the column can carry. Take Es/Ec = 18. 8

(b) Find the maximum stress and strain energy stored in a 2m long and 25mm diameter bar, when an axial pull of 15KN is suddenly applied on it. Take E as 100GPa. 7

OR

Marks

VI (a) An alloy bar 2m long is held between two supports. Find the stresses developed in the bar. When it is heated through 30K, if both the ends (i) do not yield and (ii) yield by 1 mm. Take the value of E and α for the alloy as 120GPa and 24×10^{-6}/K. 8

(b) Determine the changes in length, breadth and thickness of a steel bar 4m long, 30mm wide and 20mm thick, when subjected to an axial pull of 120KN in the direction of its length. Take E as 200GPa and poisson's ratio as 0.30. 7

UNIT — III

VII (a) A simply supported beam having length 6m, it carrying a uniformly distributed load of 4KN/m over a length of 1.5m from the left end and a udl of 2KN/m over a length of 3m from the right end and also a point load of 5KN at a distance of 1.5m from the right end. Draw the SFD and BMD for the beam and find the position and value of maximum bending moment. 8

(b) A solid steel shaft is required to transmit a torque of 6.5KNm. Calculate the minimum diameter of the shaft, if the maximum shear stress is 40 MPa. 7

OR

VIII (a) An overhanging beam ABC having length 4m and it carries a udl of 4.5KN/m on entire length. AB = 3m, BC = 1m. AB is simply supported and BC be the right end and it is overhanging. Draw the SFD and BMD for the beam and find the position and value of maximum bending moment. And also find the point of contra flexure. 8

(b) A spherical shell of 4m diameter is made up of 10mm thick plates. Calculate the change in diameter and volume of the shell, when it is subjected to an internal pressure of 2MPa. Take E = 200GPa and 1/m = 0.30 7

UNIT — IV

IX (a) An I section beam consists of two flanges 150mm × 20mm and a web of 310mm × 10mm. Find the magnitude of maximum shear stress when it is subjected to a shear force of 40KN and draw the shear stress distribution diagram over the depth of the section. 8

(b) Derive the equation in the theory of simple bending. 7

OR

X (a) A rectangular beam 300mm deep is simply supported over a span of 4m. Calculate the uniformly distributed load the beam can carry. If the bending stress is not to exceed 120MPa, Take $I = 225 \times 10^6$ mm^4. 8

(b) Derive the formula for shear stress at the section of a loaded beam. 7