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(REVISION 2015) Signature ....

THIRD SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — APRIL, 2017

THEORY OF STRUCTURES

(Common for CE and AR)

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. State the parallel axis theorem.
2. Identify the property of ductility in the metals.
3. Define modulus of resilience.
4. Write down the expression for power transmitted by the shaft.
5. Define section modulus. (5 × 2=10)

PART — B

(Maximum marks : 30)

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

1. Calculate the reactions at supports of a simply supported beam of length 6m, it carries a point load of 100KN at a distance of 2m from the left end and also it carries a udl of 20KN/m over a length of 3m from the right end.
2. Find the moment of Inertia of a rectangular section 60mm wide and 40mm deep about its centre of gravity.
3. A circular alloy bar 2m long uniformly tappers from 30mm diameter to 20mm diameter. Calculate the elongation of the rod under an axial force of 50KN. Take E for the alloy as 140GPa.
4. Sketch the stress strain diagram for mild steel and mark the important points.
5. Calculate the maximum torque of a solid shaft of 100mm diameter can transmit, if the maximum angle of twist is 1.5° in a length of 2m. Take C=70GPa.

Marks

6. A cylindrical shell 2m long and 1m internal diameter is made up of 20mm thick plates. Find the circumferential and longitudinal stress in the shell material, if it is subjected to an internal pressure of 5MPa.

7. List the assumptions in the theory of simple bending. (5 × 6 = 30)

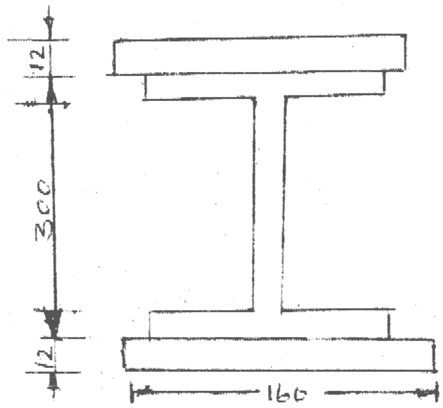
PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) A compound beam is made by welding two steel plates 160mm × 12mm one on each flange of an ISLB 300 section as shown in figure. Find the moment of inertia the beam section about an axis passing through its centre of gravity and parallel to XX axis. Take moment of inertia of the ISLB 300 section about XX axis as $73.329 \times 10^6 mm^4$.



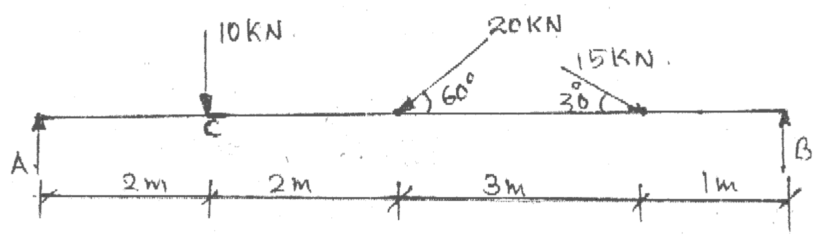
8

(b) Locate the centroid of a circle and Triangle. 7

OR

IV (a) Find the moment of inertia and least radius of gyration about the centroidal axes of rectangle section of width 60mm and depth 120mm. 8

(b) Find the reactions of a loaded beam 8m long as shown in figure.



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Marks

UNIT — II

V (a) A prismatic metallic bar of rectangular section 500mm × 200mm and 2m long is subjected to a load of 150 KN applied gradually on it. If the stress at elastic limit of bar material is 200 N/mm^2, determine (i) strain energy at the given load (ii) Proof resilience (iii) Modulus of resilience, Take E=200KN/mm^2. 8

(b) A steel bar 6m long and its both ends are firmly fixed to two walls. The original temperature of the bar is 60°C. If the bar is cooled to 30°C, determine the thermal strain and stress in the bar. Assume E_s = 200 KN/mm^2, and α_s = 12 × 10^{-6}/°C. State the nature of stress. 7

OR

VI (a) In an experiment a bar of 40mm diameter is subjected to a pull of 50KN. The measured extension on gauge length of 200mm is of 0.08mm and the change in diameter is 0.0039mm. Calculate the Poisson's ratio and the values of the Young's modulus, modulus of rigidity and bulk modulus. 8

(b) A mild steel rod of 25mm diameter and 320mm long is enclosed centrally inside a hollow copper tube of external diameter 30mm and internal diameter 25mm. Ends of rods are braced together and composite bar is subjected to an axial pull of 60KN. Find the stress developed in the rods. E_s = 200GPa, E_c = 100GPa. 7

UNIT — III

VII (a) A simply supported beam AB of length 5m, it carries two point loads 6KN and 4KN at C and D. AC=2m, CD = 1m, Draw the SFD and BMD for the beam and find the value of maximum bending moment. 8

(b) A steam boiler 3m diameter is required to carry a net working pressure of 1 N/mm^2 stress in the metal should not exceed 90 N/mm^2. Find the thickness of the metal if efficiency of the joint is 80%. 7

OR

VIII (a) Draw SFD and BMD for a overhanging beam ABC, AB = 4m, BC = 1m, AD = 2m. Beam having 5m span, it carries two point loads 10KN at a distance of 2m from the left end and 7KN at the right end point. AB is simply supported of span 4m and BC is over hang of span 1m. Also find the point of contraflexure. 8

(b) A hollow shaft of external diameter 150mm transmits 400 KW power 200rpm. Determine the maximum internal diameter, if the maximum stress in the shaft is not to exceed 50N/mm^2. 7

Marks

UNIT — IV

IX (a) A beam of I section 300mm × 120mm has flanges 20mm thick and web 10mm thick. Calculate the maximum stress developed in I section for a bending moment of 30KNm. 8

(b) A simply supported beam has a span of 5m and rectangular cross section 100mm × 200mm. Find the uniformly distributed load it can carry, if the maximum shear stress is not to exceed 0.6 N/mm^2. 7

OR

X (a) A rectangular beam 200mm deep and 300mm wide is simply supported over a span of 8m, find the udl per meter run the beam can carry, if bending stress is not to exceed 120 N/mm^2. 8

(b) A rectangular beam 100mm wide and 300mm deep is subjected to a maximum shear force of 60KNM. Determine (i) average shear stress (ii) Maximum shear stress (iii) Shear stress at a distance of 30mm above the neutral axis. 7