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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, APRIL-2020

THEORY OF STRUCTURES-I

[Maximum marks: 75] (Time: 2.15 Hours)

PART – A

(Answer any ***three*** questions in one or two sentences. Each question carries 2 marks)

I. (1). List the various systems of forces.

(2). Define moment of force.

(3). What is stress.

(4). Define shear force.

(5). Define section modulus. (3 x 2 = 6)

PART – B

(Answer any ***four*** of the following questions. Each question carries 6 marks)

II. (1). Determine the reactions of simply supported beam of span 5m, carrying a central point load 2KN and a uniformly distributed load of 1.5KN/m.

(2). Explain parallel axis theorem and perpendicular axis theorem.

(3). An axial pull of 25KN is suddenly applied on a steel rod of 2.6m long and 1100mm^2 in cross section. Calculate the strain energy, which can be absorbed in the rod. Take E = 200GPA.

(4). Explain lateral strain and volumetric strain.

(5). State the assumption in pure torsion.

(6). Explain the relationship between load, shear force and bending moment.

(7). Explain the terms Neutral axis, Moment of resistance and section modulus. (4 x 6= 24)

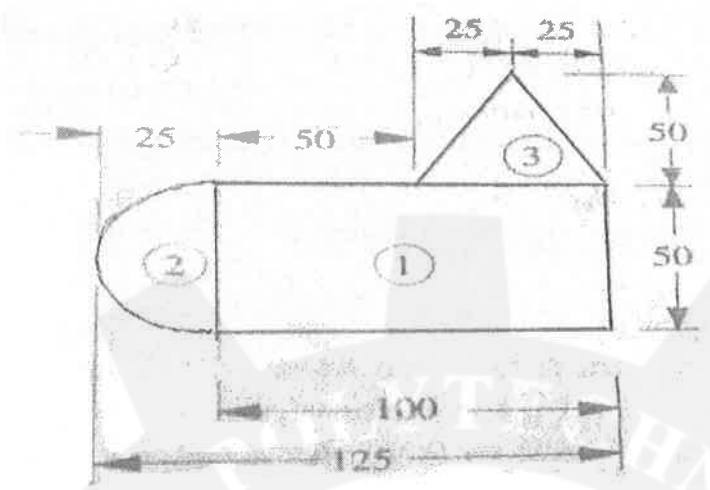
PART – C

(Answer ***any of the three units*** from the following. Each question carries 15 marks)

UNIT –I

III. (a). Show with figure the centroid of a rectangle, triangle, circle and semi circle. (6)

(b). Determine Centre of gravity from the base of the given figure. (9)



OR

IV. (a).Explain the steps involved in the determination of centre of gravity of plain figures with example as L section. (6)

(b). Find out the moment of inertia of I-section having top flange width 8 cm x 2 cm. Bottom flange 12 cm x 2cm and web 2 cm x 10cm (9)

UNIT-II

V. (a). Explain the words Elasticity and Hook's law. (6)

(b). A gun metal rod of 25mm diameter screwed at the end, passes through a steel tube of 30 mm and of 35 internal and external diameters respectively. The nuts on the rod are screwed tightly on the ends of the tube. Find the intensity of stress in each metal when the common temperature rises by 250^0C. Take-

Coefficient of expansion of steel $= 6 \times 10^{-6/o}$ C

Coefficient of expansion of gun metal $= 10 \times 10^{-6/o}$ C

Modulus of elasticity for steel = 200 GPa

Modulus of elasticity for gun metal = 100 GPa. (9)

OR

VI. (a).Explain different types of stresses. (6)

(b). A uniform metal bar of rectangular section 40mm x 20mm is of length 1.5m. Find the strain energy stored in the bar when a load of 100KN is gradually applied to it. If the elastic limit of the metal with which the bar is made is 160N/mm^2, E = 2x 10^5 N/mm^2. What will be the proof resilience and modulus of resilience? Also calculate strain energy stored when the same load applied suddenly. (9)

UNIT-III

VII. Derive torsional equation for a circular shaft. (15)

OR

VIII. (a). A Cantilever 2.5 long carries a uniformly distributed load of 60MN/m run at a length of 1.8m from the free end. Calculate the shear force and bending moment for the beam. (6)

(b). A simply supported beam AB of 8m long carrying a point load 2KN at 5m from A and a point load 3KN at 3m from A, uniformly distributed load of 2KN/m between the point loads. Determine the position and magnitude of maximum bending moment. Draw S.F and B.M diagrams. (9)

UNIT-IV

IX. (a). A simply supported beam, 230 mm wide and 280 mm deep is used to carry a uniformly distributed load of 900 N/M over a span of 4m. Find the maximum stress developed in the beam. (6)

(b). A cast iron. T section having over all depth 150mm, flange 100mm, thickness of flange and web 30mm is used as a bracket. The length of the bracket is 300mm. If the tensile stress is restricted to 200 kg/cm^2, what point load can be placed at the tip of the bracket? What will be the compressive stress developed. Centre of gravity of T section lies at 56 mm from the top of the flange. (9)

OR

X. (a). A beam of rectangular cross section is 170mm wide and 320 mm deep. If a section is subjected a maximum shear force 28KN, find the maximum shear stress and sketch the shear stress distribution along the depth of beam. (6)

(b). A 20 cm x 7cm timber beam with its longer edge vertical, spans 2m between simple supports, what is the uniformly distributed load, the beam can carry, if the permissible bending stress is $70kg/cm^2$. For the calculated safe UDL, what will be the shear stress in the section near supports. (9)