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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2023

APPLIED MECHANICS & STRENGTH OF MATERIALS

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

PART-A

[Maximum Marks: **10**]

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

1. Explain stress and strain.
2. Define factor of safety.
3. Define centroid and centre of gravity.
4. List the different types of riveted joints.
5. Define the terms spring index and stiffness. (5 x 2 = 10)

PART-B

[Maximum Marks: **30**]

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

1. Explain the terms: longitudinal strain, lateral strain and Poisson's ratio.
2. Draw stress strain diagram for brittle material under tension and identify the significant points.
3. Define moment of inertia and radius of gyration.
4. List different types of welded joints on plates
5. Define polar moment of inertia.
6. Distinguish between closely coiled and open coiled helical spring.
7. Explain the different types of loads acting on a beam with diagrams. (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 thermal stress and strain. (6)

b. A steel rod of 20 mm diameter passes centrally through a copper tube of 50 mm external diameter and 40 mm internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50°C, calculate the stresses developed in copper and steel. Take Es= 200 GN/m^2, E cu=100 GN/m^2, α_s = 12 x 10^{-6} per °C, α_{Cu} = 18 x 10^{-6} per °C. (9)

OR

IV. a. Define volumetric strain and bulk modulus. (6)

b. A bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Calculate : i) Young's modulus ii) Poisson's ratio, iii) Bulk Modulus. (9)

UNIT – II

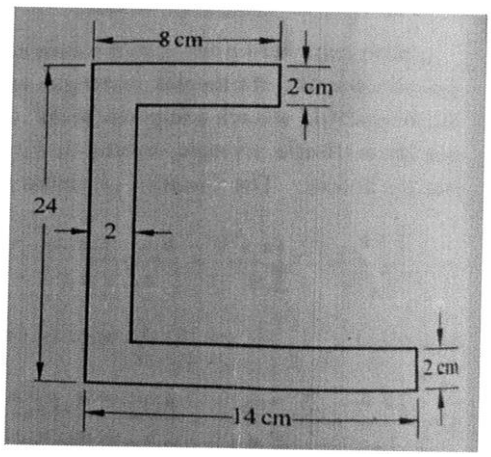
V. a. Explain coefficient of friction, angle of friction and cone of friction. (6)

b. Determine the moment of inertia of a circular lamina about its centroidal axis. (9)

OR

VI. a. State and prove perpendicular axis theorem. (6)

b. Locate the centroid of the area shown in figure. (9)



UNIT- III

VII. a. Explain: (i) Leg of the weld (ii) Size of the fillet welds (iii) Throat thickness. (6)

b. Two plates 8mm thick are joined by a double riveted lap joint. The diameter of the rivets are 16mm and pitch 8 mm. If σ_t = 120 N/mm^2, τ = 90 N/mm^2 and σ_c is 160 N/mm^2. Determine (i) The strength of riveted joint (ii) Efficiency of riveted joint. (9)

OR

VIII. a. Explain hoop stress and longitudinal stress. (6)

b. A cylinder of internal diameter 2.5 m and of thickness 5 cm contains a gas. If the tensile stress in the material is not to exceed 80 N/mm^2, determine the internal pressure of the gas. (9)

UNIT - IV

IX. a. What are the assumptions made in deriving bending equation? (6)

b. A square beam 20 mm x 20 mm in section and 2 m long is supported at the ends. The beam fails when a point load of 400 N is applied at the centre of the beam. What is the maximum stress induced in the material of beam? (9)

OR

X. a. Explain different types of beams. (6)

b. A closely coiled helical spring is to carry a load of 500 N. Its mean coil diameter is to be 10 times that of the wire diameter. Calculate these diameters if the maximum shear stress in the material of the spring is to be 80 N/mm^2. (9)

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