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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2019

APPLIED MECHANICS AND STRENGTH OF MATERIALS

[*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. Define bulk modulus.
2. Define static and kinetic friction.
3. Compare centroid and centre of gravity.
4. State the efficiency of riveted joint.
5. Define crippling load and slenderness ratio of a column when subjected to axial load. (5 × 2 = 10)

PART — B

(Maximum marks : 30)

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

1. Explain principle of superposition.
2. A steel bar 2m long and 200 mm^2 section is subjected to an axial pull of 20 KN. Find the elongation of the bar. Take E = 200 GPa.
3. State the laws of static friction.
4. List the types of welded joints and one weld term.
5. Find an expression for circumferential stress in a thin cylindrical shell due to internal pressure.
6. Distinguish between closely coiled and open coiled spring.
7. Explain over hanging beam and point of contraflexure. (5 × 6 = 30)

Marks

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Draw the stress strain diagram for mild steel under tension and identify significant points. 6

(b) A bar of 30mm × 30mm × 250mm long is subjected to a pull of 90 KN in the Direction of its length. The extension of the bar found to be 0.125 mm, while the decrease in each lateral dimension found to be 0.00376 mm. The value of modulus of rigidity for the material of the bar is 0.8×10^5 N/mm^2. Find the Young's modulus, Poisson's ratio and bulk modulus. 9

OR

IV (a) Explain the thermal stress and thermal strain induced in a simple bar when it is allowed to expand freely. 6

(b) A rod of steel is 20 meters long at a temperature of 20°C. Find the free expansion of the rod when the temperature is raised to 65°C. Find the temperature stress produced (i) when the expansion of the rod is prevented, (ii) when the rod is permitted to expand by 5.8mm. Take $\alpha = 12 \times 10^{-6}$ per °C and $E = 2 \times 10^5$ N/mm^2. 9

UNIT — II

V (a) Explain radius of gyration of a body. 6

(b) A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction 0.3. Find the magnitude of the force, which can move the body, while acting at an angle of 30° with the horizontal. 9

OR

VI (a) Find the centroid of a T section with flange 150 mm × 10 mm and web also 150 mm × 10 mm. 6

(b) Derive moment of inertia of a rectangular section. 9

UNIT — III

VII (a) Derive the formula to find the tensile strength of transverse fillet welded joints. 6

(b) A hollow shaft of external and internal diameters as 80 mm and 50 mm respectively is transmitting power at 150 rpm. Determine the power, which the shaft can transmit, if the shearing stress is not to exceed 40 Mpa. 9

OR

Marks

VIII (a) List the failure of riveted joints. 6

(b) A steam boiler of 1.25 m diameter is subjected to an internal pressure of 1.6 Mpa. If the steam boiler is made up of 20 mm thick plates, calculate the circumferential and longitudinal stresses. Take efficiency of the circumferential and longitudinal joints as 75% and 60% respectively. 9

UNIT — IV

IX (a) Explain the terms spring index, stiffness and pitch of the compression spring. 6

(b) A strut 2.5 m long is 60 mm in diameter. One end of the strut is fixed while its other end is hinged. Find the safe compressive load for the member using Euler's formula, allowing a factor of safety of 3.5. Take $E = 2.1 \times 10^5$ N/mm^2. 9

OR

X (a) State Euler's and Rankine's formula for columns subjected to axial loading. 6

(b) A cantilever beam AB 2m long carries a uniformly distributed load of 1.5 KN/m over a length of 1.4m from the free end. Draw shear force and bending moment diagrams for the beam. 9