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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, NOVEMBER – 2021

APPLIED MECHANICS AND STRENGTH OF MATERIALS

[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. State Hooks Law.
2. What is poissons ratio?
3. Define centroid.
4. Define efficiency of a rivet joint.
5. List any four types of beams. (3×2=6)

PART-B

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

II

1. A load of 5kN is to be raised with the help of a steel wire. Find the minimum diameter of the steel wire, if the stress is not to exceed 100MPa.
2. A steel rod of diameter 25mm is subjected to an axial pull of 150kN.Calculate the elongation of the rod over a gauge length of 350mm if its elastic modulus is $2x10^5 N/mm^2$.
3. Explain the laws of static friction.
4. Define hoop stress and longitudinal stress acting upon a thin shell. Write the relations to determine each of them.
5. If a shaft transmits 20kW of power at 200rpm, what is the torque generated?
6. What are the assumptions made in the Euler's theory?
7. List different types of end conditions of columns. (4×6=24)

PART-C

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

UNIT-I

III (a) A cylindrical bar is 25mm in diameter and 1m long. During a tension test it was found that the longitudinal strain is 4 times the lateral strain. Calculate the modulus of rigidity and bulk modulus, if its elastic modulus is $2x10^5 N/mm^2$. Find the change volume when the bar is subjected to a hydrostatic pressure $100N/mm^2$. (9)

(b) Draw the stress strain diagram for a ductile material under tension test and mark the important points. (6)

OR

IV (a) A flat steel bar 20mm x 20mm x 8mm is placed between two aluminium bars 200mm x 20mm x 6mm so as form a composite bar. All the three bars are fastened together at room temperature. Find the stresses in each bar where the temperature of the whole assembly is raised through 50^0C. Assume Es=200Gpa, Ea=80Gpa, $\alpha s=12x10^{-6}$ per ^0C, $\alpha a=24 x10^{-6}$ per ^0C. (9)

(b) Explain elastic moduli. (6)

UNIT – II

V (a) A body of weight 500N is pulled up an inclined plane, by a force of 350N. The inclination of the plane is 30^o to the horizontal and the force is applied parallel to the plane. Determine the coefficient of friction. (9)

(b) State: (i) Parallel axis theorem (ii) Perpendicular axis theorem. (6)

OR

VI (a) Obtain moment of inertia of a rectangular section of breadth 'b' and depth 'd' about an axis passing through the centroid and parallel to its base. (9)

(b) Define (i) Sliding friction (ii) Rolling friction (iii) Pivot friction. (6)

UNIT – III

VII (a) A double riveted, double cover, butt joint is made in 20mm thick plates with 25mm diameter rivets and 100mm pitch. Take permissible stresses in shearing as 80MPa, in bearing as 160MPa, and in tearing as 100MPa respectively. Find the strength of the riveted joint and efficiency of the joint. (9)

(b) What are the advantages of welded joints? (6)

OR

VIII (a) Find the maximum shear stress induced in a solid circular shaft of diameter 160mm when the shaft transmits 150kW power at 180rpm. (8)

(b) A seamless pipe 500mm diameter contains a fluid under a pressure of $2N/mm^2$. If the permissible stress be $100N/mm^2$. Find the minimum thickness of the pipe. (7)

UNIT – IV

IX (a) A close coiled helical spring of round steel wire 10mm in diameter having 10 complete turns with a mean diameter of 120mm is subjected to an axial load of 200N.Determine

(i) The deflection of the spring

(ii) Maximum shear stress in the wire, and

(iii) Stiffness of the spring. Take Modulus of rigidity = $8x10^4 N/mm^2$ (9)

(b) Explain the classification of columns. (6)

OR

X (a) A hollow mild steel tube 6m long 40mm internal and 6mm thick is used as a strut with both ends hinged. Find the crippling load and safe load taking factor of safety as 3. Take $E=2x10^5 N/mm^2$. (9)

(b) Compare close coiled helical springs with open coiled helical spring. (6)

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