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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL - 2025

APPLIED MECHANICS & STRENGTH OF MATERIALS

[Maximum marks: 100] [Time: 3 Hours]

PART – A
Maximum marks: 10

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

1. State hook's law.
2. Define factor of safety.
3. State limiting friction.
4. Define thin cylinder.
5. State cantilever beam. (5 x 2 = 10)

PART – B
Maximum marks: 30

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

1. Define modulus of rigidity. And write down the relation between Modulus of Rigidity and Youngs modulus.
2. In an experiment, a steel specimen of 13 mm diameter was found to elongate 0.2 mm in a 200 mm gauge length when it was subjected to a tensile force of 26.8 kN. If the specimen was tested within the elastic range, what is the value of Young's modulus for the steel specimen?
3. Explain the laws of friction.
4. Briefly explain Moment of inertia and radius of gyration.
5. Describe how to calculate the strength of welded joint.
6. Explain different types of rivet joints with the help of neat sketch.
7. Describe the classification of beams with neat sketch. (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) Demonstrate stress - strain diagram with a neat sketch and explain different points on it. (8)

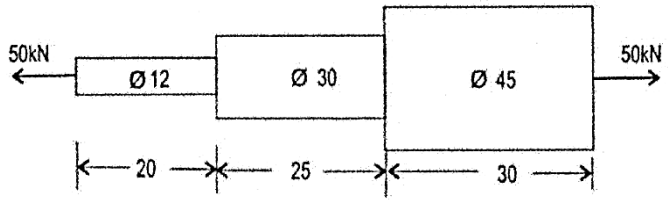
(b) A load of 5kN is to be raised with the help of a steel wire. Find the minimum diameter of the steel wire, if the stress is not to exceed 100 MPa. (7)

OR

IV. (a) An axial load of 50 KN is acting on a bar consisting of 3 sections as shown in the figure. If Youngs Modulus is 2.1 x 10^5 N/mm^2, Determine. (7)

(i) Stress in each section

(ii) Total elongation.



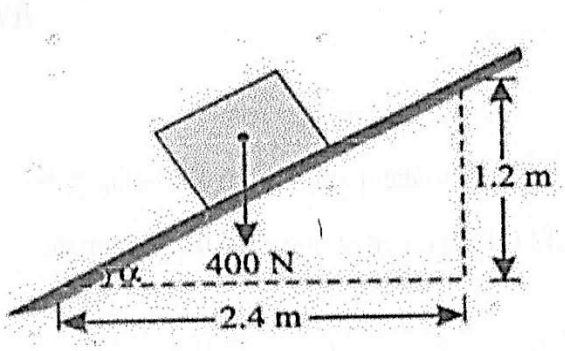
(b) A rod is 2m long at a temperature of 10^0C. Find the expansion of rod, when temperature is raised to 80^0C. If this expansion is prevented find the stress induced in the material of the rod.

Take E = 1 x 10^5 MN/m^2. And α=0.000012 per degree centigrade. (8)

UNIT - II

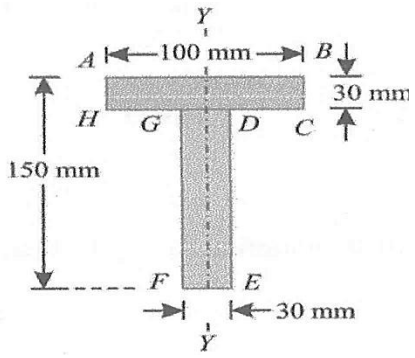
V. (a) A block of weight 200N is placed on a rough horizontal floor. If μ = 0.25, find the pull P required to move the block if P is inclined upwards at 30^0 to the horizontal. (7)

(b) An inclined plane as shown in Fig. is used to unload slowly a body weighing 400N from a truck 1.2 m high into the ground. The coefficient of friction between the underside of the body and the plank is 0.3. State whether it is necessary to push the body down the plane or hold it back from sliding down. What minimum force is required parallel to the plane for the purpose. (8)

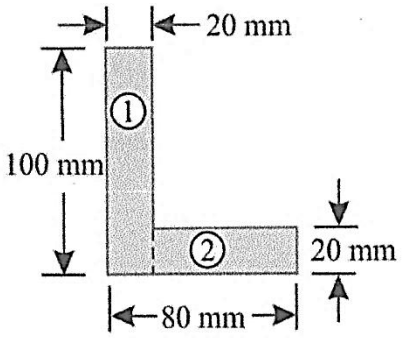


OR

VI. (a) Find the centre of gravity of a 100 mm x 150 mm x 30 mm T-section given in the figure (7)



(b) Find the moment of inertia about the centroidal X-X and Y-Y axes of the angle section shown in figure. (8)



UNIT - III

VII. (a) A single riveted lap joint is made in 12 mm thick plates with 22 mm diameter rivets. Determine the strength of the rivet, if the pitch of the rivets is 60 mm. Take allowable stresses in shearing as 60 MPa, in bearing as 150 MPa and in tearing as 80 MPa respectively. (9)

(b) Write a short note on different types of welded joints with neat sketch. (6)

OR

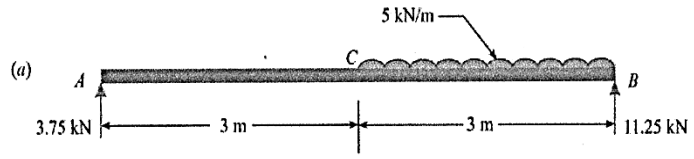
VIII. (a) Derive general torsion equation. (7)

(b) A circular shaft of 60 mm diameter is running at 150 r.p.m. If the shear stress is not to exceed 50 MPa, find the power which can be transmitted by the shaft. (8)

UNIT – IV

IX. (a) A simply supported beam 6 m long is carrying a uniformly distributed load of

5 kN/m over a length of 3 m from the right end. Draw.



(i) S.F. Diagram

(ii) B.M. diagrams for the beam

(iii) Calculate the maximum B.M. on the section. (10)

(b) Distinguish between long column and short column with figure. (5)

OR

X. (a) A closely-coiled helical spring of round steel wire 5 mm in diameter having 12 complete coils of 50 mm mean diameter is subjected to an axial load of 100N. Find the deflection of the spring and the maximum shearing stress in the material. Modulus of rigidity (C) = 80 GPa. (9)

(b) Explain how to draw shear force diagram and bending moment diagram. (6)
