

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/  
COMMERCIAL PRACTICE, APRIL 2022**

**APPLIED MECHANICS AND STRENGTH OF MATERIALS**

(Maximum Marks:100)

(Time: 3 Hours)

**PART - A**  
( Maximum marks : 10 )

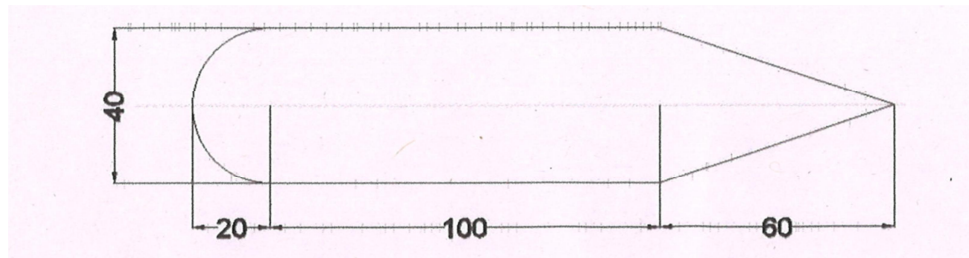
**Marks**

- I. Answer all the questions in one or two sentences. Each question carries 2 marks.
1. State Hook's law.
  2. Define Coefficient of friction.
  3. Explain polar moment of inertia.
  4. Distinguish between close coiled and open coiled helical spring.
  5. Differentiate between long column and short column. (5 x 2 = 10)

**PART - B**

( Maximum Marks: 30 )

- II Answer **any five** questions from the following. Each question carries 6 marks.
1. Explain young's modulus, Bulk modulus and Modulus of rigidity.
  2. Determine the position of centroid of the section shown in figure



3. Explain sliding friction, rolling friction and pivot friction.
4. Explain with sketches the possible ways of failure in riveted joints
5. Find the power transmitted by a circular shaft of 50mm diameter at 120 rpm. The maximum shear stress in the shaft is not to exceed  $60\text{N/mm}^2$ .
6. Draw the shear force and bending moment diagram for a simply supported beam carrying a point load  $W$  at the middle of span ' $l$ '.
7. State the assumptions made in Euler's theory.

(5 x 6 = 30)

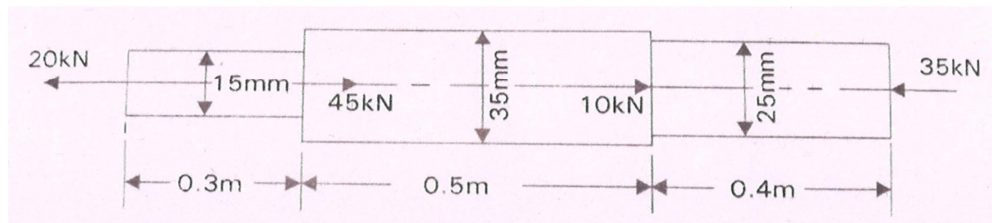
**PART – C**

(Maximum marks: 60 )

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

**UNIT - 1**

- III (a) Draw the stress-strain diagram for ductile material and mark the significant points. (5)
- (b) A bar of varying section is subjected to axial load as shown in figure below. Determine the stress in each section. (10)



**OR**

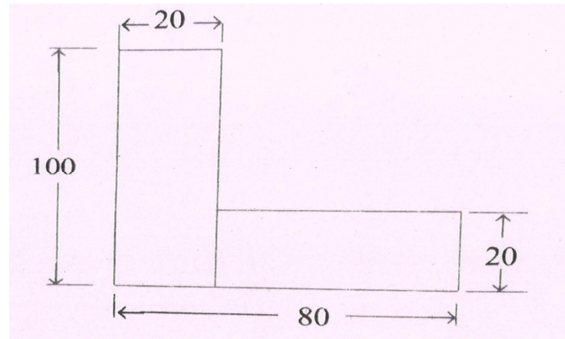
- IV (a) A weight of 300kN is supported by three short pillars, each 500mm<sup>2</sup> in section. The central pillar is of steel and the outer ones are of copper. The pillars are so adjusted that at a temperature of 15°C each one carry equal load. The temperature is then raised to 115° C. Estimate the stress in pillars.  
[  $E_s = 2 \times 10^5 \text{ N/mm}^2$ ;  $E_c = 0.8 \times 10^5 \text{ N/mm}^2$ ;  $\alpha_s = 12 \times 10^{-6}/^\circ\text{C}$ ;  
 $\alpha_c = 18.5 \times 10^{-6}/^\circ\text{C}$ ] (10)
- (b) Define thermal stress and strain (5)

**UNIT – 2**

- V (a) Explain angle of repose and cone of friction. (5)
- (b) The force required to pull a body of weight 50N on a rough horizontal plane is 15N. Determine the co-efficient of friction if the force is applied at an angle of 15° with the horizontal.

**OR**

- VI. (a) Find the moment of inertia about XX and YY axes passing through its centroid of the section shown in figure. (10)



- (b) Explain perpendicular axis theorem. (5)

### UNIT – 3

- VII (a) Explain the caulking and fullering process with a neat sketch. (5)
- (b) A boiler shell is to be made of 10 mm thick plate having limiting tensile stress of  $105 \text{ N/mm}^2$ . If the efficiencies of longitudinal and circumferential joints are 70% and 30% respectively, determine the permissible intensity of internal pressure when the shell diameter is 1.3m. (10)

### OR

- VIII (a) Explain the advantages of welded joints over riveted joints. (5)
- (b) A double riveted, double cover, butt joint is made in 20 mm thick plates with 25mm diameter rivets and 100 mm pitch. Take permissible stresses in shearing as 80 MPa, in bearing as 160MPa, and in tearing as 100 MPa respectively. Find the pull per pitch length of the joint and efficiency of the joint. (10)

### UNIT – 4

- IX (a) List the different types of springs. Also define the terms spring index and stiffness. (5)

- (b) A beam 3m long, simply supported at its end, is carrying a central point load of 10 kN. Find the maximum slope and deflection of the beam. Take  $I = 12 \times 10^6 \text{ mm}^4$  and  $E=200\text{GPa}$ . (10)

**OR**

- X (a) Define equivalent length of column. Also explain the relation between equivalent length and actual length for various end conditions of column. (5)
- (b) The external and internal diameter of a hollow cast iron column are 50mm and 40 mm respectively. If the length of the column is 3m and both of its ends are fixed, determine the crippling load using Rankine's formula. Take the values of  $\sigma_c = 550 \text{ N/mm}^2$  and  $\alpha = \frac{1}{1600}$  in Rankine's formula. (10)

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