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FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—MARCH, 2013

APPLIED MECHANICS AND STRENGTH OF MATERIALS

(Common for ME, TD and WP)

[*Time* : 3 hours

(Maximum marks : 100)

PART—A

(Maximum marks : 10)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. State Hooke's law and propose the importance in the behaviour of ductile materials.
2. Define centre of gravity.
3. List the different types of springs.
4. Define shear force.
5. Write slenderness ratio of a column. (5×2=10)

PART—B

(Maximum marks : 30)

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

1. Summarise the nature and magnitude of stresses due to change in temperature.
2. A M.S bar carries an axial load of 75 kN. If the allowable tensile stress is 50 N/mm^2, find the diameter of the rod.
3. Derive the expression for moment of inertia of a rectangular section.
4. A body weighing 540 N is hauled along a rough horizontal plane by a pull of 180 N acting at an angle of 30° with horizontal. Find the coefficient of friction.
5. Illustrate four different types of welded joints with the help of necessary sketch.
6. A 900 mm diameter pipe contains a fluid at a pressure of 2.5 N/mm^2. If the safe stress in tension is 100 N/mm^2, find the thickness of the pipe.
7. Draw the shear force and bending moment diagram of a simply supported beam with point load acting at the centre after calculating the magnitude. (5×6=30)

Marks

PART—C

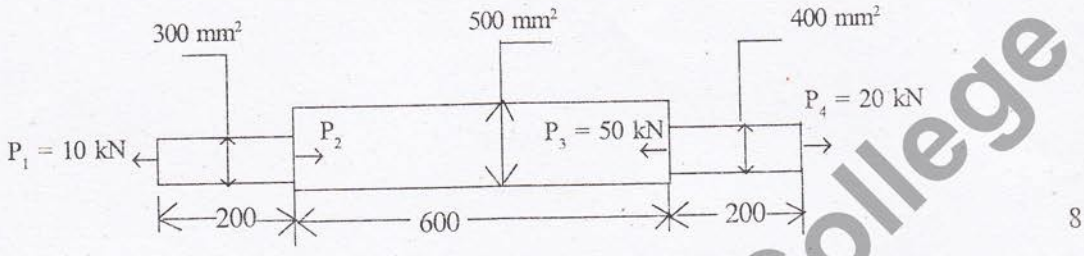
(Maximum marks : 60)

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

UNIT—I

III (a) Compare the failure of Mild steel and cast iron with the help of stress-strain diagram. 7

(b) A member ABCD is subjected to point load as shown in figure. Determine P_2 and change in length of the member. Take E = 200 Gpa.



8

OR

IV (a) List and explain four different types of strains. 7

(b) A bar of 25 mm diameter is subjected to an axial pull of 62.5 kN. The extension over a gauge length of 200 mm is 0.4 mm and decrease in diameter is 0.013 mm. Calculate :

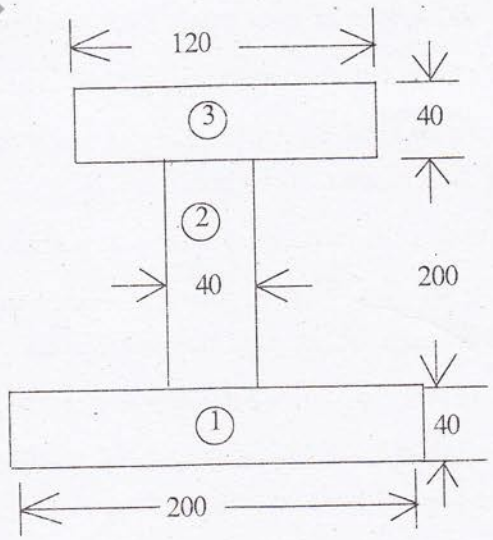
(i) Modulus of elasticity (iii) Bulk modulus

(ii) Modulus of rigidity (iv) Poisson's ratio. 8

UNIT—II

V (a) State the laws of static friction and dynamic friction. 7

(b) An I section is made of three rectangles as shown in figure. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section.



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OR

Marks

VI (a) State and prove parallel axis theorem. 7

(b) A body of weight 2000 N is to be pulled up an inclined plane of angle 20°. Coefficient of friction between body and plane is 0.3. Find the effort required when :

(i) When effort P is parallel to the plane
(ii) P is parallel to the base. 8

UNIT—III

VII (a) List the different types of riveted joints. Explain any two with the aid of sketch. 7

(b) A solid steel shaft has to transmit 100 kW at 160 rpm. Taking allowable shear stress as 70 MPa, find the suitable diameter of the shaft. The maximum torque transmitted in each revolution exceeds the mean torque by 20%. 8

OR

VIII (a) Describe the following :

(i) Polar moment of inertia (iii) Stiffness of shaft

(ii) Polar modulus 7

(b) A closely coiled helical spring is required to exert a force of 2.5 kN and to have stiffness of 80 kN/m. If the mean diameter of the coil is to be 90 mm and the working stress 220 N/mm^2, find the number of turns and the diameter of steel rod of which it is made. Assume $G = 0.8 \times 10^5$ N/mm^2. 8

UNIT—IV

IX (a) Classify and explain with the aid of sketch the different types of loads applied on beam. 7

(b) A bar of length 4 m when used as a simply supported beam and subjected to a uniformly distributed load of 30 N/mm over the entire span deflects 15 mm at the centre. Determine the crippling load when both ends fixed. 8

OR

X (a) Explain the four different end conditions used to find out the crippling load on columns. 7

(b) A beam of length 1.2 m is simply supported at its ends and carries two point loads of 3.5 kN and 4 kN at distances of 0.4 m and 0.8 m from the left end support. Draw SF and BM diagrams for the beam. 8

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