TED (15) 4021

(Revision-2015)

N20-00305

Reg.No.....

Signature.....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER-2020

APPLIED MECHANICS AND STRENGTH OF MATERIALS

[Maximum marks: 75] (Time: 2.15 Hours)

PART – A

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

1. Define Poisson's ratio.
2. Define coefficient of friction.
3. State the definition of centre of gravity.
4. Define the term polar moment of inertia.
5. What is spring index? (3 x 2 = 6)

PART – B

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

1. Draw stress strain diagram for mild steel under tension and identify the significant points.
2. A steel rod of 25mm diameter and 4m long is connected to two grips and maintained at a temperature 80^0C. Determine the stress and pull exerted when the temperature falls to 30^0C if the ends yield by 1.5mm. Take E= 2.1×10^5 N/mm^2 and coefficient of linear expansion for steel $12 \times 10^{-6}/^0$C .
3. Derive the moment of inertia of a rectangular section of breadth 'B' and depth 'D' about horizontal axis.
4. Sketch different types of failures of a riveted joint.
5. A steam boiler of 800m diameter is made up of 12 mm thick plates. If the pressure inside the boiler shell is 3 MPa, find the circumferential and longitudinal stresses induced in the boiler plates.
6. Illustrate different types of beams and loading.
7. Define the terms buckling load or crippling load, effective length and slenderness ratio. (4 x 6= 24)

PART – C

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

UNIT –I

III.(a) Explain Young's modulus, Modulus of rigidity and Bulk modulus (5)

(b) A steel bar ABCD is subjected to point loads P1,P2,P3 and P4 as shown in figure 1. Determine the magnitude of the force P_2 necessary for equilibrium. If P_1 =45 kN, P_3=450 kN and P_4=130 kN. Also find the change in length of the bar. Take E= $2.1x10^5 N/mm^2$ (10)

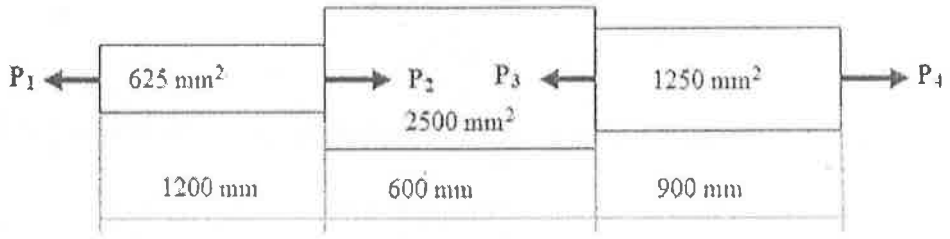

Fig. 1

OR

IV. (a) Explain thermal stress and strain. (5)

(b) Determine the change in length, breadth and thickness of a steel bar which is 5 m long, 50 mm wide and 30 mm thick is subjected to an avail pull of 40 kN in the direction of its length. Take E=$2.0 \times 10^5 N/mm^2$ and Poisson's ratio = 0.3 (10)

UNIT-II

V. (a) State the laws of static friction. (5)

(b) A body weighs 500N dragged upon a plane inclined at an angle 30^0 to the horizontal. A force of 400N incline at 20^0 with the plane can just move up the plane.

(i) Draw the FBD diagram indicating forces

(ii) Find the normal reaction

(iii) Find the co-efficient of friction

(iv) Coefficient of friction between the surfaces. (10)

OR

VI. (a) Explain axis of reference and axis of symmetry. (5)

(b) Find the moment of inertia of the section shown in Fig about XX axis passing through its centre of gravity. (10)

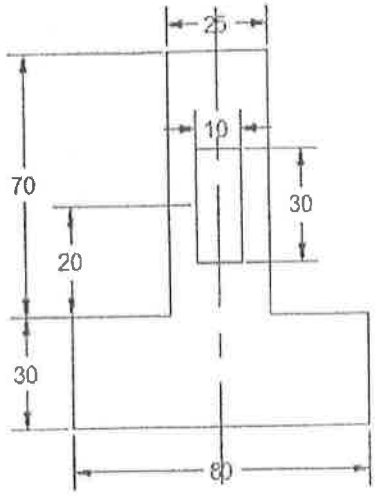

Fig. 2 All dimensions are in mm

UNIT-III

VII.(a) Illustrate and write the purpose of caulking and fullering (5)

(b) A single riveted double cover butt joint is used to connect two plates 10mm thick. The rivets are 25 mm diameter with 90mm pitch. The allowable tensile, shear and crushing stresses are 150 N/mm^2, 80N/mm^2 and 175N/mm^2 respectively. Determine the efficiency of the joint. (10)

OR

VIII. (a) Explain briefly stresses in a thin cylinder subjected to internal pressure (5)

(b) A hollow shaft having an inside diameter half of its outside diameter and has to transmit 200 kW at 100 rpm. Find the inside and outside diameters of the shaft, if the maximum allowable shear stress is 60 MPa. (10)

UNIT-IV

IX. (a) Distinguish between closely coiled and open coiled helical spring. (5)

(b) Draw shear force diagram and bending moment diagram of the cantilever beam shown (10)

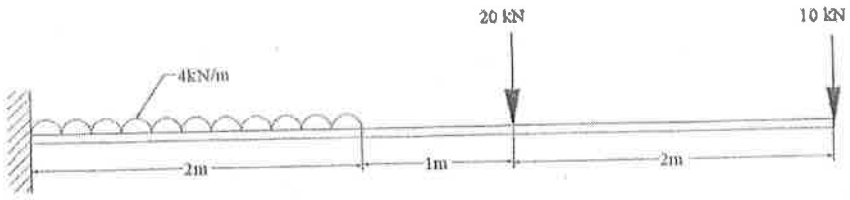

Fig. 3

OR

X. (a) List the assumptions made in Euler's theory for axially loaded elastic long columns (5)

(b) A steel beam of 120mm wide, 200mm deep and 5m long is simply supported at its ends carrying a central point load of 70kN. The Young's modulus of beam is given as 2.1×10^5 N/mm^2. Calculate (i) Deflection at the centre of the beam and (ii) slope at the supports. (10)

******