TED (15) – 4021 Reg. No.....

(REVISION — 2015) Signature .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

APPLIED MECHANICS AND STRENGTH OF MATERIALS

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. What is Poisson's ratio ?
2. Define cone of friction.
3. Define polar moment of inertia.
4. List any four types of beams.
5. Differentiate column and strut. (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Explain elastic moduli.
2. Analyse the force applied parallel to the plane on a body sliding down on an inclined plane.
3. State and prove the perpendicular axis theorem.
4. Define and show any four common welding terms.
5. Find the power transmitted by a solid circular shaft of 50 mm diameter at 120 rpm. The maximum shear stress in the shaft is not to exceed 60 N/mm^2.
6. A cantilever of 3m long carries two point loads each 4 kN, one placed at free end and the other at 2 m from fixed end. Draw SF and BM diagrams.
7. Explain end conditions of columns and it's equilent length. (5×6 = 30)

Marks

PART — C

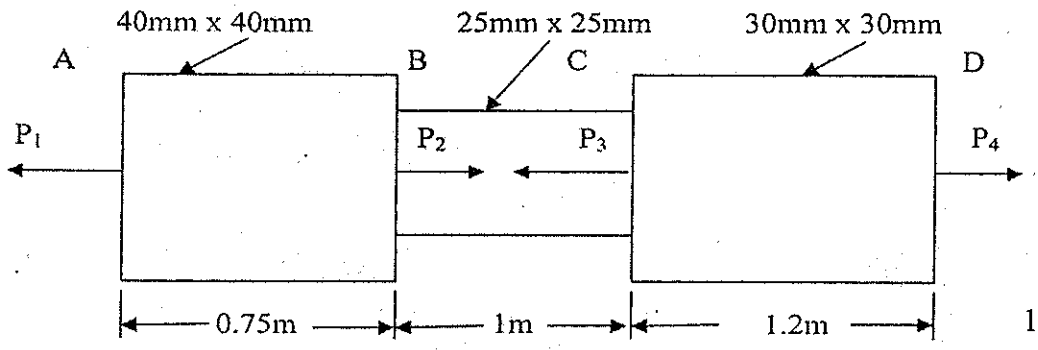
(Maximum marks : 60)

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

UNIT — I

III (a) Explain ultimate stress, working stress and factor of safety. 5

(b) A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in figure. Calculate the force P_3 necessary for equilibrium, if $P_1 = 120kN$, $P_2 = 220kN$ and $P_4 = 160kN$. Determine also the net change in length of the bar. Take $E = 200GN/m^2$.



10

OR

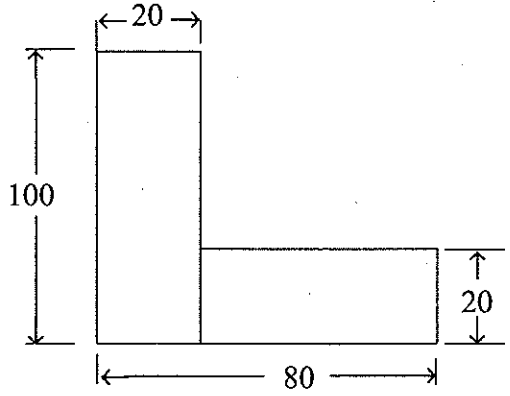
IV (a) Explain shear stress, shear strain and modulus of rigidity. 5

(b) A compound rod 1 m long is made up of copper rod 400 mm long and steel rod 600 mm long connected end to end. The cross section area of copper rod is 1000 mm^2 and that of steel rod is 1500 mm^2. The compound rod is then held firmly between two rigid supports and heated through 100°C. Calculate the stresses developed in copper and steel rods. Take $E_c = 1 \times 10^5$ N/mm^2, $E_s = 2 \times 10^5$ N/mm^2; $\alpha_c = 18 \times 10^{-6}/^0C$, $\alpha_s = 12 \times 10^{-6}/^0C$. 10

UNIT — II

V (a) State laws of dynamic friction. 5

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



10

OR

Marks

VI (a) Illustrate the moment of inertia of rectangle, triangle and circle plane figures. 5

(b) A man is walking over a dome of 10 m radius. How far he can descend from the crown of the dome without slipping ? Take coefficient of friction between the surface and the shoe of the man is 0.75. 10

UNIT — III

VII (a) Explain the failure of riveted joints. 5

(b) A single riveted lap joint is used to connect 12 mm thick plates, by providing 20 mm diameter of rivets at 50 mm pitch. Determine the strength of the joint and joint efficiency. Take working shear stress in rivets is 80 N/mm^2, working stress in bearing in rivets is 250N/mm^2 and working stress in axial tension in plates is 156N/mm^2. 10

OR

VIII (a) Compare the failures of a thin cylinder shell due to internal pressure. 5

(b) A boiler shell is to be made of 12 mm thick plate having limiting tensile stress of 100 N/mm^2. If the efficiencies of longitudinal and circumferential joints are 75% and 35% respectively, determine the maximum permissible diameter of the shell to withstand a steam pressure of 1.2 N/mm^2. 10

UNIT — IV

IX (a) List any five assumptions made in Euler's theory of long column. 5

(b) A timber beam 150 × 300 mm cross section supports a central load on a span of 4 m. If the maximum bending stress is 8 N/mm^2, what is the maximum deflection ? Take Modulus of elasticity as 0.1 × 10^{5}N/mm^2. 10

OR

X (a) A close coiled helical spring of round steel wire 6 mm in diameter having 12 complete coils of 60 mm mean diameter is subjected to an axial load of 125N. Find the deflection of the spring and the maximum shear stress in the material. G = 0.8 × 10^5 N/mm^2. 5

(b) Find the crippling load given by Rankine's formula for tubular strut 2.25 m long having outer and inner diameters as 37.5 and 32.5 mm respectively loaded through pin joints at both ends. Take yields stress as 315 N/mm^2: a = 1/7500. 10