[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2125)

15004

B. Tech 1st Semester Examination

Engineering Mechanics (CBS)

ME-101

Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : This question paper carries five sections. Attempt any five questions selecting atleast one question each from section A, B, C & D. Section E is compulsory.

SECTION - A

1. (a) Two steel cylinders are supported in a right angle wedge support as shown in Fig. 1. The side OL makes an angle of 30° with the horizontal. The diameters of the cylinders are 250 mm and 500mm; their weights being 100 and 400N respectively. Determine the reaction R between the smaller cylinder and the side OL.

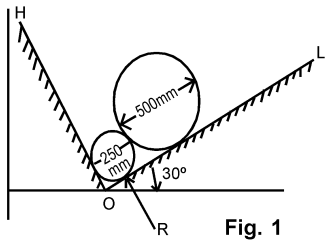

Fig. 1

(b) Determine the centroid of the built up section in Fig. 2 and find the moment of inertia and radius of gyration about the horizontal centroidal axis.

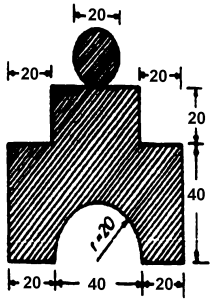

Fig. 2

(5+7=12)

[P.T.O.]

2. (a) Determine the forces in all the members of the truss shown in Fig. 3. Tabulate the results and Indicate the magnitude and nature of forces on the diagram of the truss. (Use Method of Joints to solve this problem)

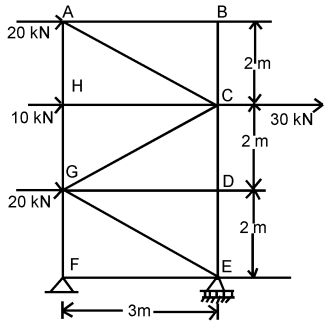

Fig. 3

(b) Differentiate between Perfect, Deficient and Redundant frames. (9+3=12)

SECTION - B

3. (a) A straight uniform bar AD is clamped at both ends and loaded as shown in Fig. 4. Initially the Bar is stress free. Determine the stresses in all the three parts (AB, BC, CD) of the bar if the cross-sectional area of the bar is 1000mm^2.

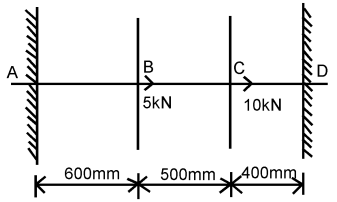

Fig. 4

(b) Two vertical rods as shown in Fig. 5, one of steel and the other of bronze, are rigidly fastened at upper ends at a horizontal distance of 760mm apart. Each rod is 3m long and 25mm in diameter. A horizontal cross-piece connects the lower ends of the bars. Where should a load of 4.5 kN be placed on the cross piece so that it remains horizontal after being loaded.

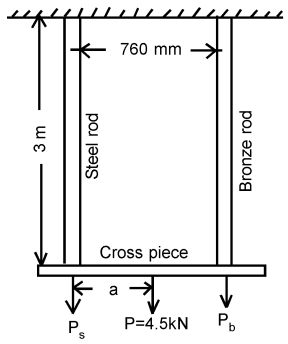

Fig. 5

(6+6=12)

4. (a) A beam AB is 10m long, carries a uniformly distributed load of 20kN/m over its entire length together with concentrated load of 50 kN at the left end A and 80 kN at the end B. The beam is to be supported at two props (C & D) at the same level, 6m apart so that the reaction is same at each. Determine the positions of the supports and draw Shear force and Bending Moment diagrams. Find the value of maximum B.M.

(b) Establish the relationship among load, shear and bending Moment with suitable example. (9+3=12)

SECTION - C

5. A beam simply supported at ends and having cross-section as shown in Fig. 6 is loaded with a UDL, over whole of its span. If the beam is 8m long, find the UDL, if the maximum permissible bending stress in tension is limited to 30MN/m^2 and in compression to 4530MN/m^2. What are the actual maximum bending stresses set up in the section? (12)

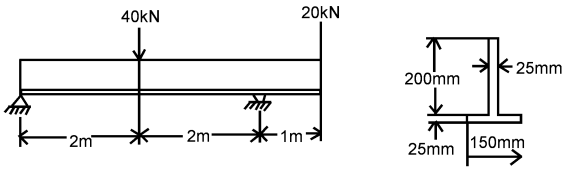

Fig. 6

6. An I-section having flanges 200mm x 20 mm and web 400mm x 15mm is used as a beam. If at a section, it is subjected to a shear force of 150kN, find the greatest intensity of shear stress in the beam and show also the variation of shear stress across the section. (12)

SECTION - D

7. (a) Assuming the same material, same length and same outside diameter, prove that a hollow shaft will transmit more power as compared to a solid shaft, when subjected to same torque.

[P.T.O.]

(b) Determine the maximum shear stress in the shaft subjected to the external torques as shown in Fig. 7. (5+7=12)

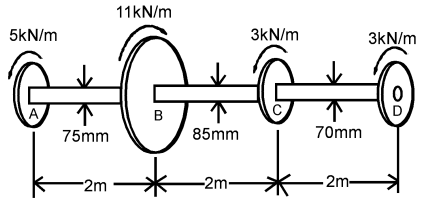

Fig. 7

8. A uniform ladder rests with one end against a smooth vertical wall and the other on the ground, the coefficient of friction being 0.75. If the inclination of the ladder to the ground be 45°. Show that a man, whose weight is equal to that of ladder, can just ascend to the top of the ladder without its slipping. (12)

SECTION - E

9. (a) Differentiate between rigid and elastic body. (2)

(b) State and Explain Lami's theorem. (2)

(c) Explain the significance of free body diagram in mechanics. (1)

(d) Draw the stress-strain diagram for a ductile and brittle material. (1)

(e) What is meant by point of contraflexure? (1)

(f) State the different means of supporting a beam and differentiate between an overhanging, a cantilever and a continuous beam. (1)

(g) Explain briefly the various laws of friction with examples. (1)

(h) Give a physical significance of shear force and bending moment at a cross-section in a beam. (1)

(i) Explain the various laws of friction with examples. (1)

(j) Show with the help of sketches the variation of shear force on a simply supported beam Due to (1) concentrated load (2) UDL throughout the length. (1)