

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA
Mid Semester Examination for Session 2023-24

COURSE NAME: B.TECH

SEMESTER: 1st

BRANCH NAME: FOR ALL BRANCHES
 SUBJECT NAME: ENGINEERING MECHANICS

FULL MARKS: 30

TIME: 90 Minutes

Answer All Questions.

The figures in the right-hand margin indicate Marks. Symbols carry usual meaning.

Q1. Answer all Questions. [2×3]

- | | | |
|----|--|-----|
| a) | State and prove the Theorem of Varignon. | CO1 |
| b) | State the laws of friction. | CO1 |
| c) | Define the terms statically determinate, statically indeterminate and redundant support. | CO2 |

Q2.

- a) The smooth cylinder rest in a horizontal channel having vertical walls, the distance between which is a (Fig. 1). Find the pressures exerted on the walls and floor at the points of contact A, B, D and F. The following numerical data are given: $P = 200$ N, $Q = 400$ N, $R = 300$ N, $r_1 = 120$ mm, $r_2 = 180$ mm, $r_3 = 150$ mm and $a = 540$ mm.

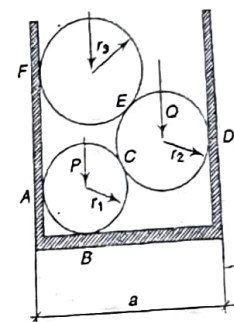


Figure 1

Or

- b) A horizontal beam AB is hinged to a vertical wall at A and supported at its mid-point C by a tie rod CD as shown in Fig. 2. Find the tension S in the tie rod and the reaction at A due to a vertical load P applied at B.

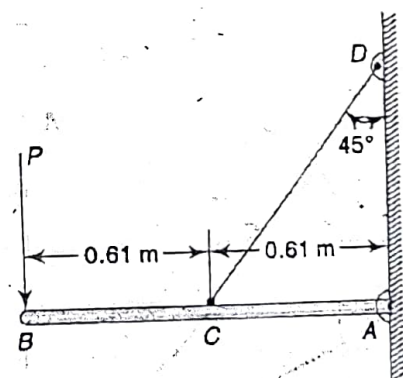


Figure 2

Q3.

What is maximum load W that a 5500 N force will hold up if the coefficient of friction at Y is 0.20 in the arrangement shown in Fig. 3. Neglect other friction and weight of the member.

If $W = 2000$ N is supported from the pulley what are the normal and tangential forces transmitted at Y taking 4500 N force applied at X.

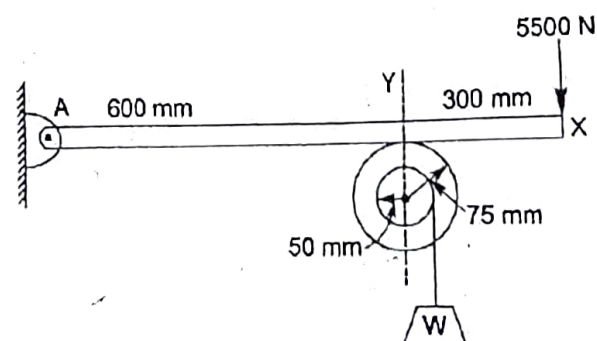


Figure 3

Or

Find the minimum value of the horizontal P applied to the lower block in Figure 4, to hold the system in equilibrium. Take $\mu = 0.25$ at the floor, 0.3 , at the wall, and 0.2 between the blocks.

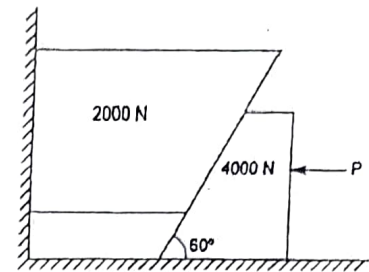


Figure 4

[8]

CO1

- Q4. Find the forces in the members of the loaded structure shown in Fig. 5

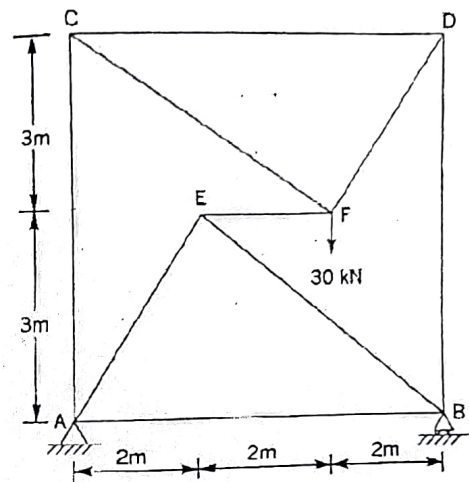


Figure 5

CO2

[8]

Or

Determine the axial force in each bar of the plane truss supported and loaded as shown in Fig. 6. ABCD is a square; AC is horizontal. C and D points are roller-supported.

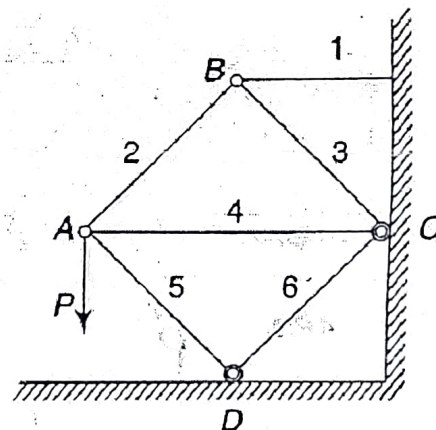


Figure 6

[8]

CO2