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Total Number of Pages: 3

BTECH
ME101

End-semester Examination – 2015

Engineering Mechanics

BRANCH: CSE/IT

Time: 3 Hours

Max marks: 50

Answer any five.(Each question carries equal marks)

1. A) In Fig. 1 , weights P and Q are suspended in a vertical plane by strings 1, 2 and 3 arranged as shown in the Fig. 1 . Find the tension induced in each string if P = 30 kN, Q = 40 kN, $\alpha = 40°$ and $\beta = 50°$. Also find the inclination γ of the segment CD to the vertical.

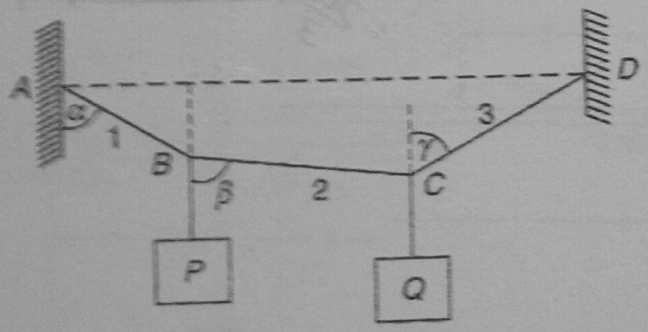

Fig. 1

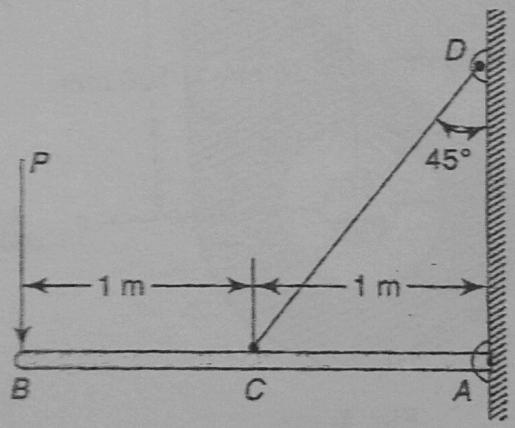

Fig. 2

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 vertical load P applied at B.

2. A) Referring to Fig. 3, the coefficients of friction are as follows: 0.25 at the floor, 0.3 at the wall, and 0.2 between blocks. Find the minimum value of a horizontal force P applied to the lower block that will hold the system in equilibrium.

B) Calculate the axial force in each bars 1, 2, 3 and 4of the plane truss shown in Fig. 4.

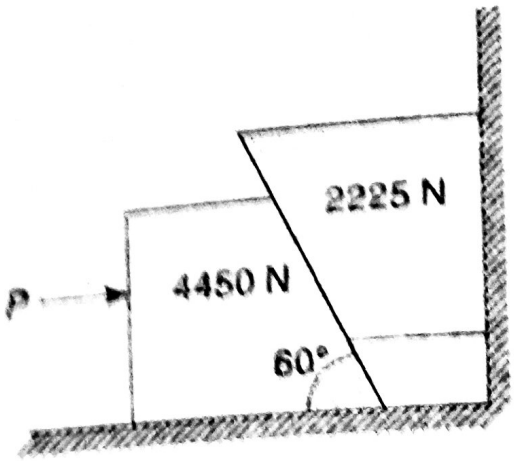

Fig. 3

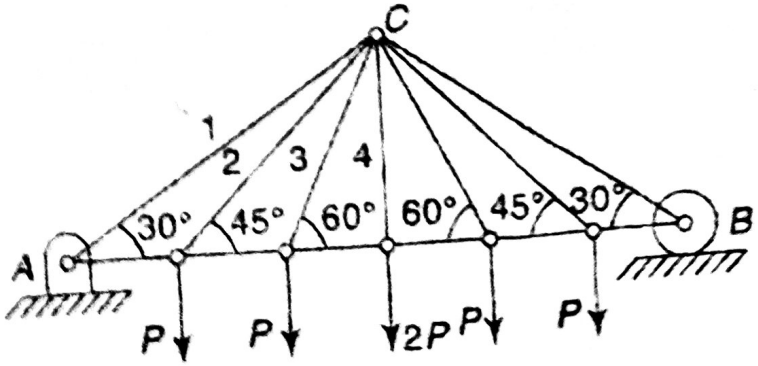

Fig. 4

3. Calculate the moment of inertia of the shaded area in Fig. 5 with respect to a centroidal axis parallel to the x-axis.

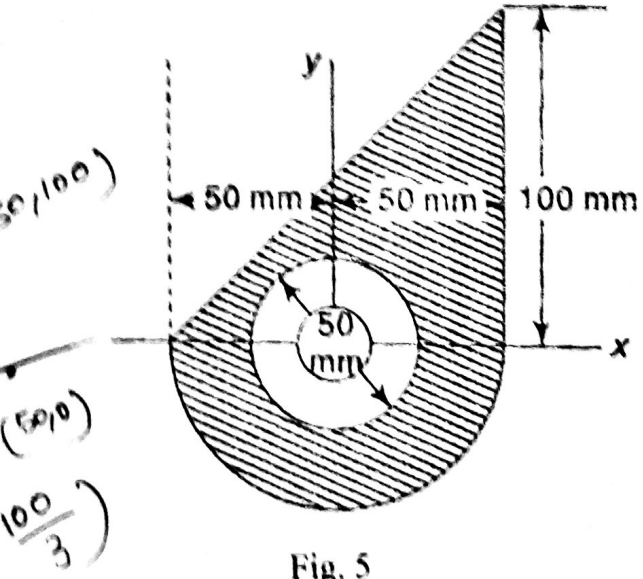

Fig. 5

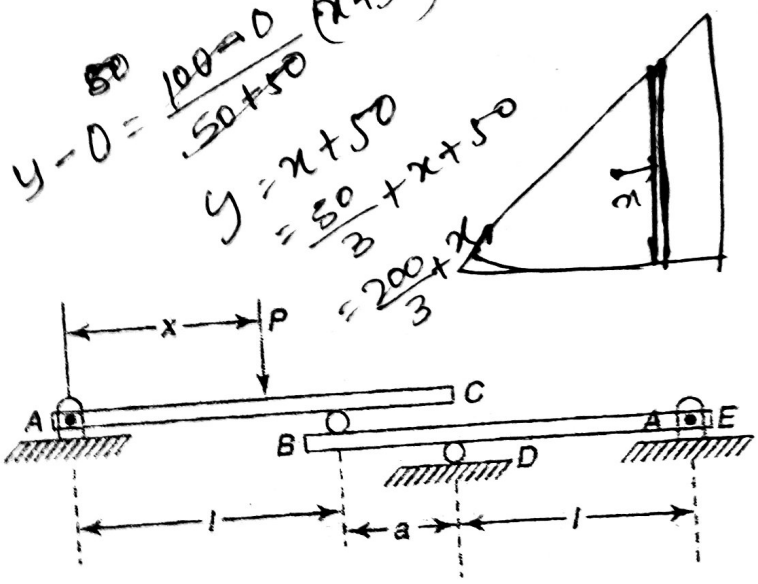

Fig. 6

4. A) Using the principle of virtual work, find the reaction R_d for the system shown in Fig.6 for any position of a vertical load P on the beam AC as defined by its distance x from A.

B) A weight W attached to the end of a small flexible rope of diameter d = 6.25 mm is raised vertically by winding the rope on a reel as shown in fig. 7. If the reel is turned uniformly at the rate of 2rps, what will be the tension S in the rope? Neglect inertia of the pulley and slight lateral motion of the of the suspended weight W.

5. A) Find the tension S in the string during motion of the system shown in fig.8, if W_1 = 890N; W_2 = 445N. The system is in a vertical plane, and the coefficient of friction between the inclined plane and the block W1is μ = 0.2. Assume the pulleys to be without mass.

B) For the ideal system shown in fig.9, the weight W_1 hangsat a height x_1 above the floor in equilibrium configuration. Calculate the period of free vibration of the system if the weight W_1 performs small oscillations $x_1 = a \cos pt$ about its position of equilibrium. Take $W_1 = W_2 = 44.5N$; $k = 356N/m$. Neglect the mass of the spring.

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