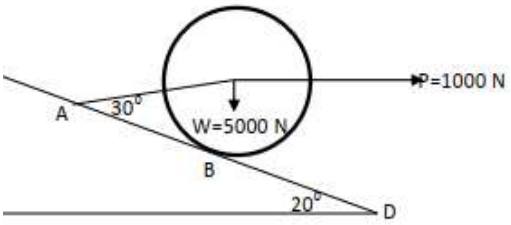
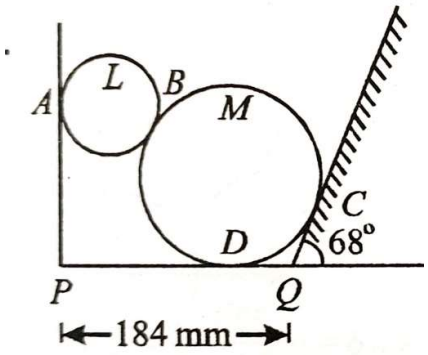
ABES ENGINEERING COLLEGE, GHAZIABAD
Department of Mechanical Engineering Session 2023-24
Fundamentals of Mechanical Engineering (BME 101)

TUTORIAL SHEET: UNIT 1

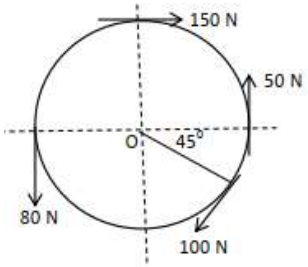
1. A right circular roller of weight 5000 N rest on a smooth inclined plane and is held in position by a cord AC as shown in Fig. 1.20. Find the tension in the cord if there is a horizontal force of magnitude 1000 N acting at C.



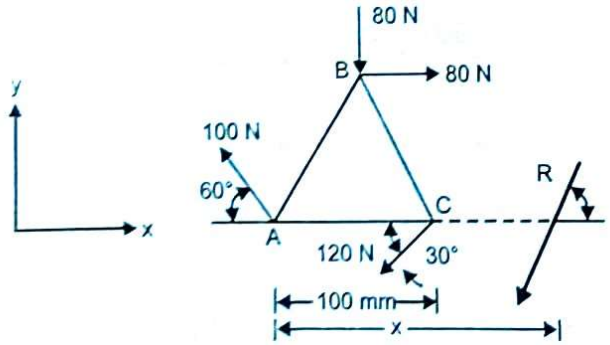
2. (i) A wheel of 60 cm diameter and 1.5 kN weight rests against a rectangular obstacle of thickness 20 cm. Find the least horizontal pull to be applied (a) through the centre of the wheel, (b) through the top point on its vertical diameter, to over-turn the wheel over the obstacle.
   (ii) A wheel of 60 cm diameter and 1.5 kN weight rests against a rectangular obstacle of thickness 20 cm. Find the least pull to be applied through the centre of the wheel to just turn the wheel over the corner of the obstacle.
3. Compute the reactions at all the contact surfaces. Neglect friction on all surfaces. Diameters of the cylinders L and M are 72 mm and 152 mm respectively. W_L = 48 kgF and W_M = 72 kgF.



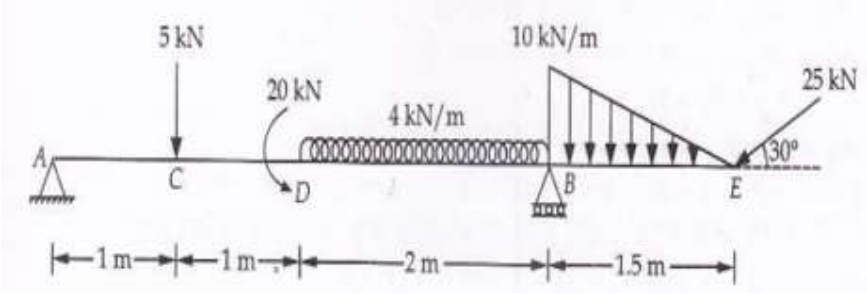
4. Determine the resultant of the four forces acting tangentially to a circle of radius 3m as shown in Fig.1. What will be the location of the resultant with respect to centre of the circle?



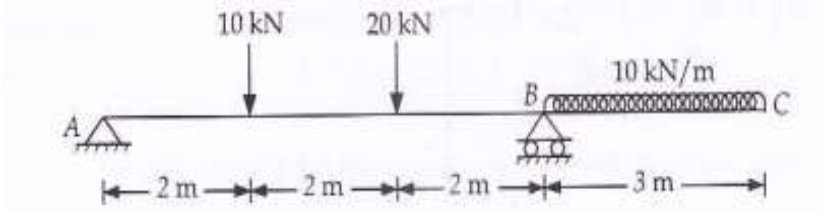
5. Find the resultant of the force system shown in the figure acting on a lamina of equilateral triangular shape. Also find the location of its line of action with respect to the corner A.



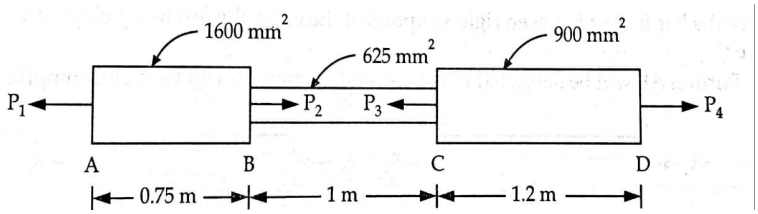
6. A beam has been loaded and supported as shown in figure given below. Determine the reactions at the support points A and B:



7. A beam has been loaded and supported as shown in figure given below. Determine the reactions at the support points A and B.

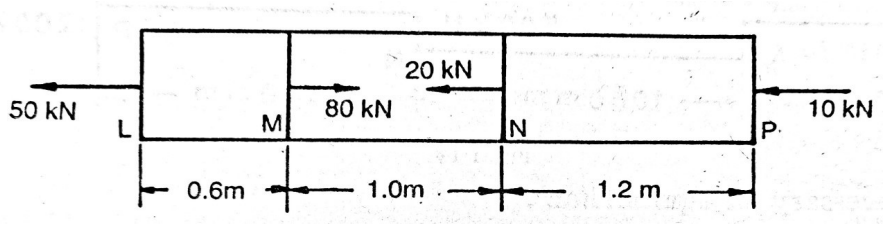


8. A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in figure given below:



Calculate the force P_3 necessary for equilibrium if P_1 = 120 kN, P_2=220 kN and P_4=160 kN. Determine change in length of the member. Take modulus of elasticity 200 GN/m^2.

9. A brass bar having cross sectional area of 1000 mm2 is subjected to axial forces as shown in the figure. Find the total elongation of the bar. Take Mod of elasticity of Brass = 100 GPa.



10. A steel bar of square cross-section 35 mm x 35 mm, 500 mm long stretches 0.2 mm under a pull of 100 kN. The same bar in single shear test under a force of 122.5 kN shows a distortion of original right-angle corners by 0.00125 radian. Determine the values of the four elastic constants of the material.

11. A square bar 50 mm x 50 mm is subjected to a compressive load of 500 KN. The contraction over 200 mm length is 0.5 mm and increase in thickness is 0.04 mm. Calculate the value of the four elastic constants of the material.