

FE SEM-I C. Scheme (NEP 2020) June 2025

11/06/25

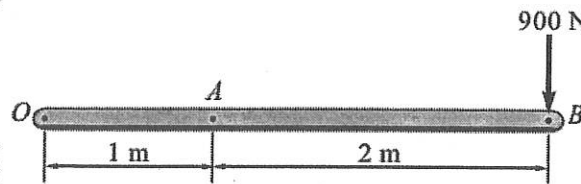
Time: 2 Hrs

Max. Marks: 60

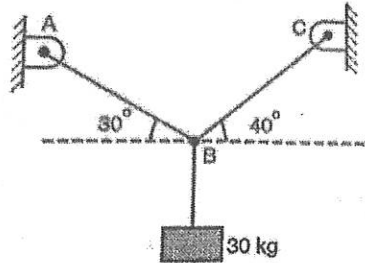
- N. B. (1) Question No.1 is compulsory.
 (2) Attempt any 3 questions from remaining five questions.
 (3) Assume suitable data if necessary and mention the same clearly.
 (4) Take $g = 9.81 \text{ m/s}^2$.

Q1. Solve any Five

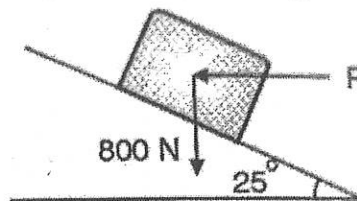
- a) Resolve the force $F = 900 \text{ N}$ acting at B as shown in Fig. into parallel components at O and A. (03)



- b) Determine the tensions in the cords AB and BC for equilibrium of 30 kg block. (03)

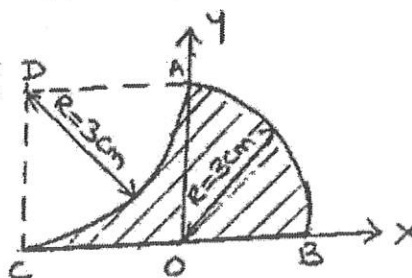


- c) A support block is acted upon by two forces as shown in fig. Knowing that the coefficient of friction between the block & the incline are $\mu_s = 0.35$, $\mu_k = 0.25$. Determine the force P required to prevent it from slipping down. (03)



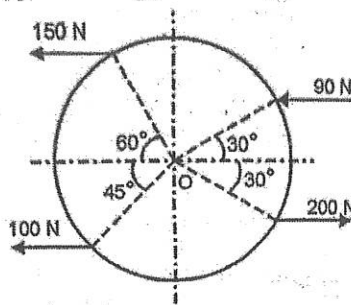
- d) A force of magnitude 50 kN is acting at point A(2,3,4) m towards point B(6,-2,-3) m. Find the components of this force along X, Y and Z axis. (03)
 e) The acceleration of a particle in rectilinear motion is given by $a = 100 - 3X^2 \text{ m/s}^2$. Knowing that at $t = 0$, $v = 0$ and $x = 0$ find the velocity of the particle at $x = 8 \text{ m}$. (03)
 f) Explain with neat sketch 1) Direct central Impact 2) Oblique central Impact. (03)

- Q 2 Find the coordinate of the centroid for the shaded part of the lamina with respect to given reference axis. (07)

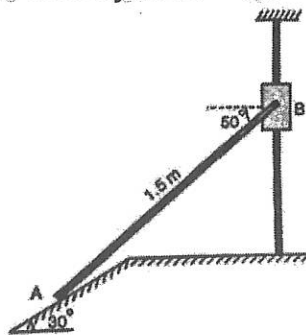


B) The position vector of a particle which moves in the X-Y plane is given by $\vec{r} = (3t^3 - 4t^2)\mathbf{i} + (0.5t^4)\mathbf{j}$ m. Calculate Velocity and acceleration at $t = 4$ Sec (08)

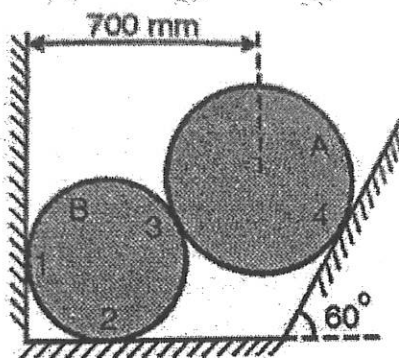
Q 3 Determine the resultant of the following force system as shown in figure. Also locate its position w. r. t. O. Radius of circle is 2 m. (07)



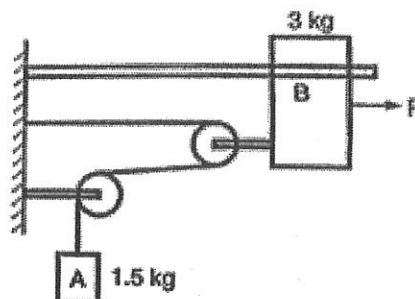
B) Collar B moves up with constant velocity of $V_B = 2$ m/s. Rod AB is pinned at B. Find the angular velocity of rod AB and velocity of A. (08)



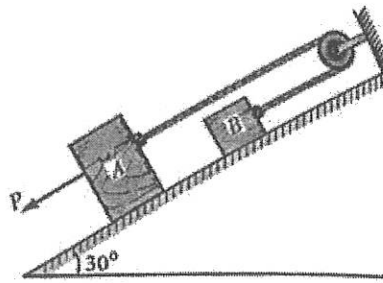
Q 4. Two spheres A and B weight 1000 N and 750 N. Determine the reaction at all contact points (07)



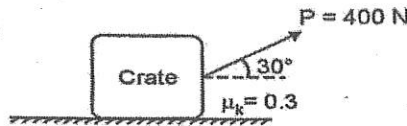
B) The system shown in figure is initially at rest. Neglecting friction determine the force 'P' required if the velocity of the collar B is 5 m/s after 2 sec and corresponding tension in the cable. (08)



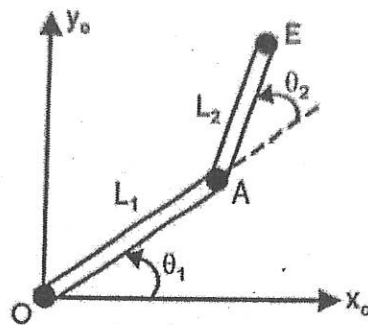
- Q 5. Determine the force P to cause the motion to impend. Take masses of the block A & B as 8 kg & 4 kg respectively and the coefficient of sliding friction as 0.3. The force P and the rope are parallel to the inclined plane. Assume frictionless pulley. (07)



- B) A 50 kg crate shown in fig, rest on horizontal plane for which the coefficient of kinetic friction is $\mu = 0.3$. If the crate does not tip over when it is subjected to a 400-N force, determine the velocity of the crate in 8 sec starting from rest using impulse momentum principle. (08)



- Q 6. A planar elbow manipulator is shown. Write the D H parameters and hence locate the position and orientation of the end E of the manipulator. Given $L_1 = L_2 = 250$ mm and $\theta_1 = \theta_2 = 30^\circ$ (07)



- B) For the beam loaded as shown in figure, Calculate the support reactions at A and B. (08)

