

FE Sem-I C-Scheme June 2026

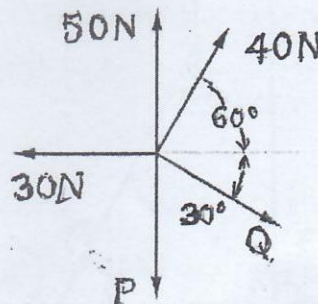
Time: 3 Hours

Total Marks: 80

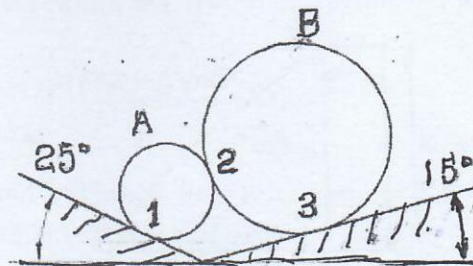
- Question-1 is compulsory.
- Answer any three from remaining five questions.
- Assume any suitable data wherever required, but justify the same. Assumptions made should be clearly stated.
- Illustrate answers with sketches, wherever required.

1. Answer any four

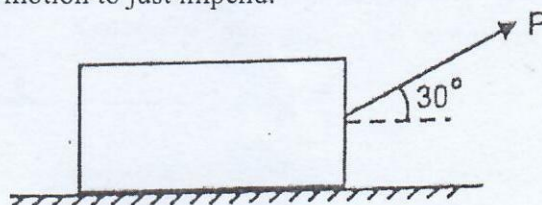
- a. Two concurrent forces P and Q acts at O such that their resultant acts along x-axis. Determine [05]
the magnitude of Q and the Resultant



- b. Determine the reactions at the point of contacts 1, 2 and 3. Assume smooth surface. $m_A = 1$ [05]
 $kg, m_B = 4 kg, r_A = 1 cm, r_B = 4 cm$

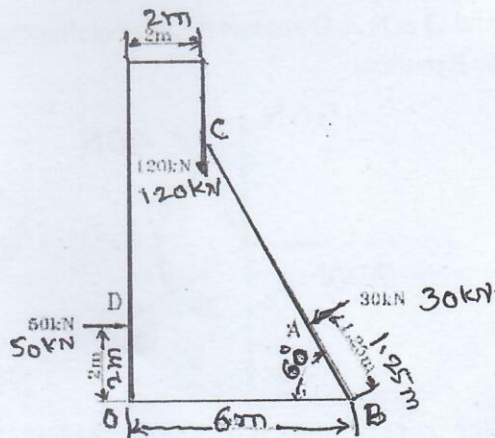


- c. A 1000 N block is kept on a rough horizontal surface having $\mu_s = 0.35$. Force P is applied as [05]
shown. Determine P for motion to just impend.

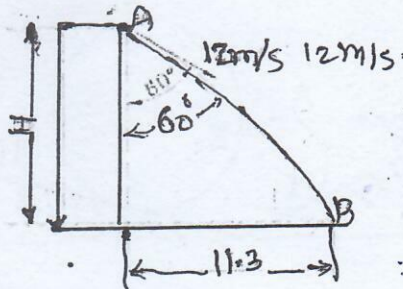


- d. A car covers a distance of 100 m in 6 s and it takes another 5 s to cover next 120 m. Find the initial velocity and uniform acceleration of the car. [05]
- e. i) Define the Instantaneous Centre of Rotation and explain the properties of Instantaneous Centre of Rotation. (3 marks) [05]
 ii) State Impulse - Momentum principle. (1 mark)
 iii) Define Coefficient of Restitution. (1 mark)
- g. Rectilinear motion of a particle is defined by equation $V^3 = x^2$. Determine velocity and acceleration at $x = 8$ m [05]

- 2a. The forces acting on 1 m length of a dam are shown in figure. Determine the resultant force acting on the dam. Calculate the point of intersection of the resultant with the base. [06]

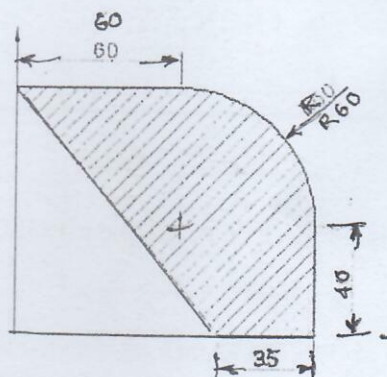


- b. A ball thrown with speed of 12 m/s at an angle of 60° with a building strikes the ground 11.3 m horizontally from the foot of the building as shown. Determine the height of the building. [08]



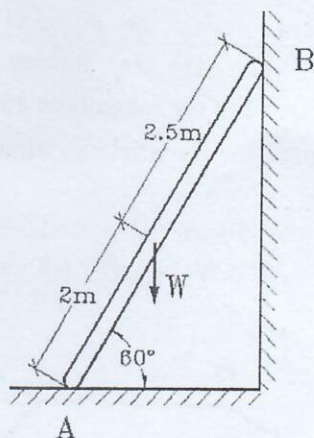
- c. Three perfectly elastic balls A, B and C of masses 2 kg, 4 kg and 8 kg move along a line with velocities 4 m/s, 1 m/s and 0.75 m/s, respectively. If the ball-A strikes the ball-B, which in turn strikes the ball-C, determine the velocities of the three balls after the impacts. [06]

- 3a. Determine the centroid of the shaded area with respect to the given x and y axes. All dimensions are in mm. [06]

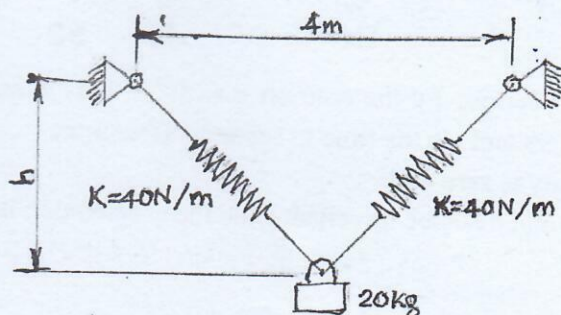


- b. [06]

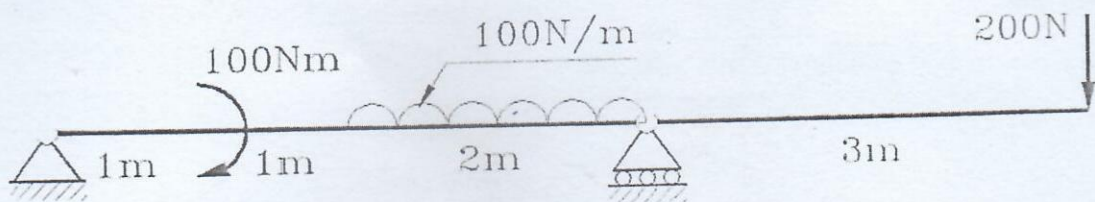
A homogeneous ladder shown in figure rests against a smooth wall at A and a rough horizontal floor at B. The mass of the ladder is 30 kg and is concentrated at a location 2 m from bottom as shown in the figure. The coefficient of static friction between the ladder and the floor is 0.35. Will the ladder stand in 60° position?



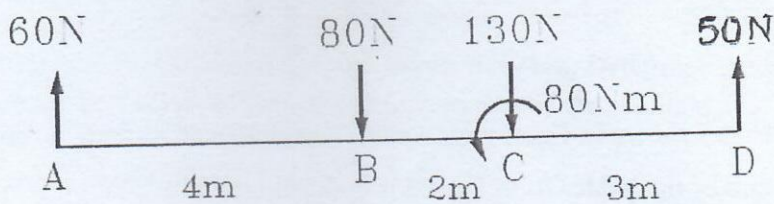
- c. A cylinder has mass 20 kg and is released from rest, when $h = 0$. Determine the speed when $h = 3$ m. The springs have un-stretched lengths of 2 m. [08]



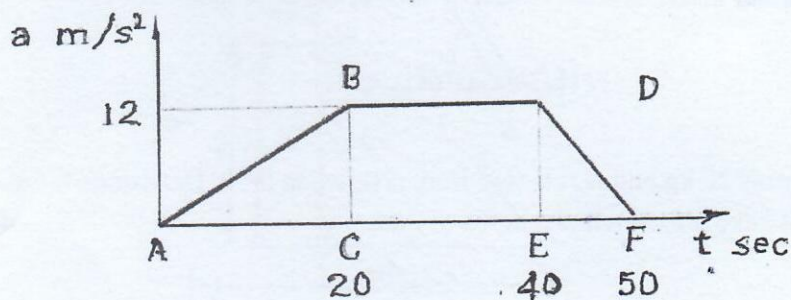
- 4a. Determine the reactions of all supports of the given beam. [07]



- b. Convert the given force system into a force and a couple at point A. [07]



- c. A truck travels along a circular road of radius 50 m at a speed of 4 m/s. For a short distance when $t = 0$ speed is increased by $dv/dt = 0.4t$ m/s². Determine the speed and the magnitude of acceleration when $t = 4$ s. [6]
- 5a. The lines of actions of three concurrent forces at the origin 'O' passing through points A (1, 2, 4), B (3, 0, -3) and C (2, -2, 4) are having magnitudes $F_A = 40$ N, $F_B = 10$ N and $F_C = 30$ N, respectively. Find the magnitude and direction of their resultant. [08]
- b. Figure below shows a plot of $a-t$ curve for a particle moving along a straight line. Draw $v-t$ curve. [07]
Determine the speed of the particle after 50 sec. Also, find the maximum speed attained by the particle.



- c. The motion of particle is defined by the relation $x = 3t^3 - 18t^2 + 26t + 8$, where x is the position expressed in meters and t is the time in seconds. Determine [05]
(i) Time when the velocity is zero and
(ii) The position and the total distance travelled when the acceleration becomes zero.

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