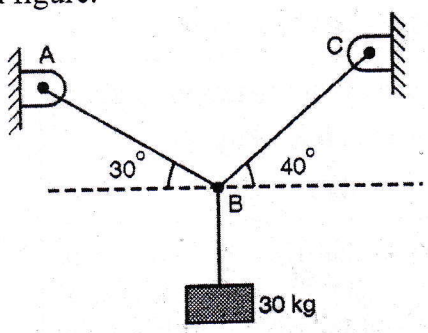
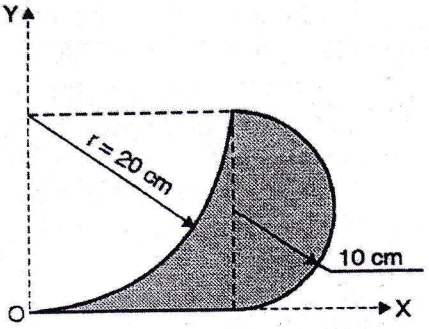
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2025
(B. Tech) Program: COMP/IT/AI-DS/EXTC Scheme : III
Regular Examination: FY Semester: I
Course Code: BSC104 and Course Name: Engineering Mechanics
Date of Exam: 19/01/2026 Duration: 02.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.
(4)Use g = 9.81 m/s².

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Determine the tensions in cords AB and BC for equilibrium of 30kg block as shown in figure. 		1	U
b)	Find the centroid of shaded area with reference to X and Y axes. 		2	U
c)	The guy cables AB and AC are attached to the top of the transmission tower as shown in the figure 1c. The tension in cable AC is 8 KN. Determine the required tension 'T' in cable AB such that the net effect of the two cable tensions is a downward force at point A. Determine the magnitude R of this downward force.		1	U

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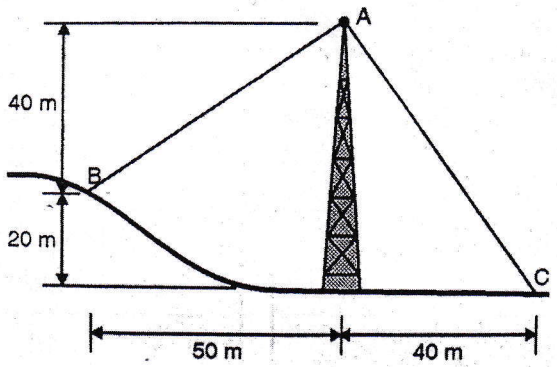
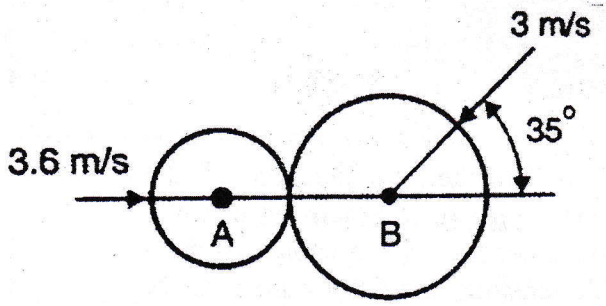


figure 1c

Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	A particle starts from rest from origin and its acceleration is given by $a = \frac{k}{(x+4)^2}$ m/s². Knowing that v = 4m/s when x = 8m, find: (i) Value of k (ii) Position when v=4.5 m/s.		4	U
b)	A ball is thrown from horizontal level, such that it clears a wall 6 m high, situated at a horizontal distance of 35 m. If the angle of projection is 60° with respect to the horizontal, what should be the minimum velocity of projection?		4	A
c)	Just before they collide, two disks on a horizontal surface have velocities as shown in the figure. Knowing that 90N disk 'A' rebounds to the left with a velocity of 1.8m/s. Determine the rebound velocity of the 135N disk 'B'. Assume the impact is perfectly elastic. 		6	U

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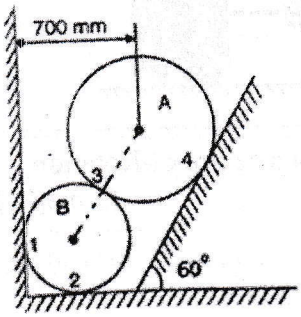
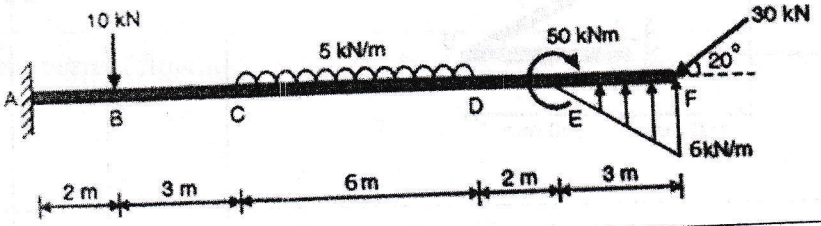
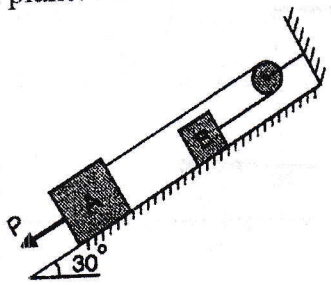
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Two spheres 'A' and 'B' of weight 1000N and 750N respectively are kept in a channel as shown in figure. Determine the reactions at all contact points 1,2,3 and 4. Radius of 'A' is 400mm and radius of 'B' is 300mm. 		1	A
b)	i) What are the different types of support for a beam? Explain each one of them along with their support reactions. (3 marks)		1	R,A
	ii) For the beam shown, find the reaction at point A'. (7 marks) 			
c)	Determine the force 'P' required for the motion to impend. Take masses of blocks 'A' and 'B' as 8kg and 4kg respectively and the coefficient of sliding friction as 0.3. The force 'P' and rope are parallel to the inclined plane. Assume frictionless pulley. 		3	A

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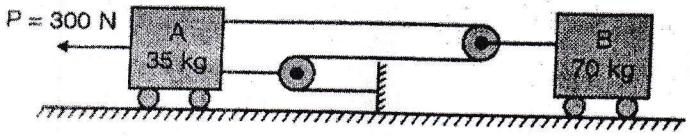
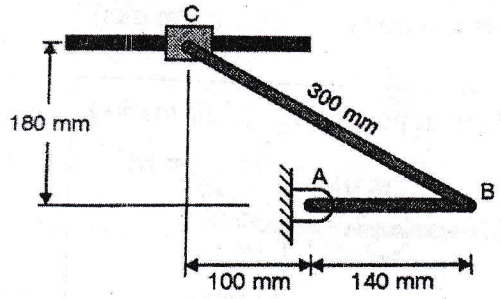
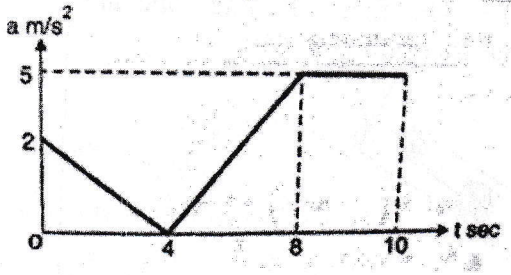
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Determine the acceleration of A and B and the tension in the cable due to application of 300N forces as shown. Neglect friction and mass of the pulleys. 		6	A
b)	i) With suitable example explain Instantaneous centre of Rotation (ICR). (3 marks)		5	R,A
	ii) In the mechanism shown, collar 'C' slides on a horizontal rod. In the position shown rod AB is horizontal and has angular velocity of 0.6 rad/sec clockwise. Determine angular velocity of BC and velocity of collar 'C'. (7 marks) 			
c)	A particle is projected with an initial velocity of 2m/s along a straight line. The relation between acceleration and time is given in the diagram. Draw v-t and s-t diagram. 		4	A

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