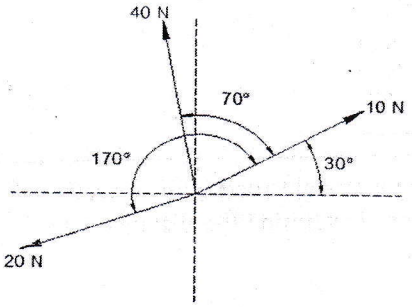
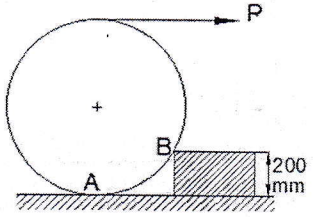
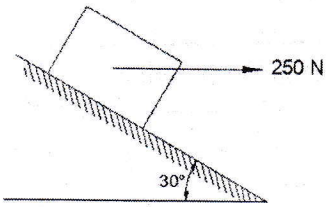
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

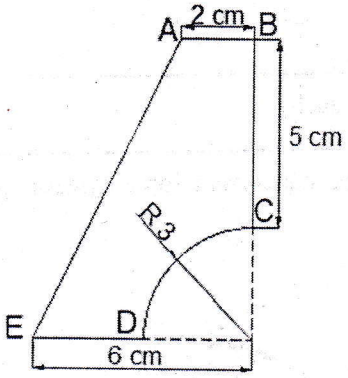
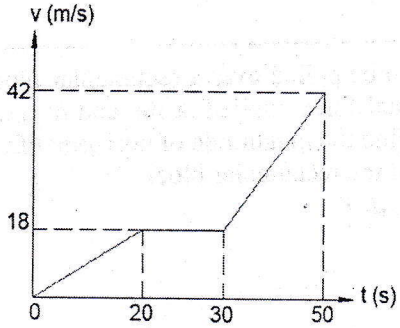
April 2026 ~~Nov – Dec 2025~~
(B. Tech.) Program: All Branches Scheme III
Supplementary ~~Regular~~ Examination: FY Semester: I
Course Code: BSC104 and Course Name: Engineering Mechanics
Date of Exam: ~~19-01-2026~~ 13-04-2026 Duration: 02.5 Hours Max. Marks: 60

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	Determine the resultant and its direction for the concurrent force system shown in figure 	5	1	U
b)	A roller of radius 400 mm weighing 4 kN is to be pulled over a rectangular block of size 200 mm as shown in figure by a horizontal force applied at the end of a string wound round the circumference of the roller. Find the magnitude of horizontal force P which will just turn the roller over the corner of the rectangular block. 	5	1	U
c)	A block of mass 30 Kg is placed on an inclined plane as shown in figure. μ_k between the block and plane is 0.3. If a horizontal force of 250 N acting on block, find its acceleration. 	5	6	U

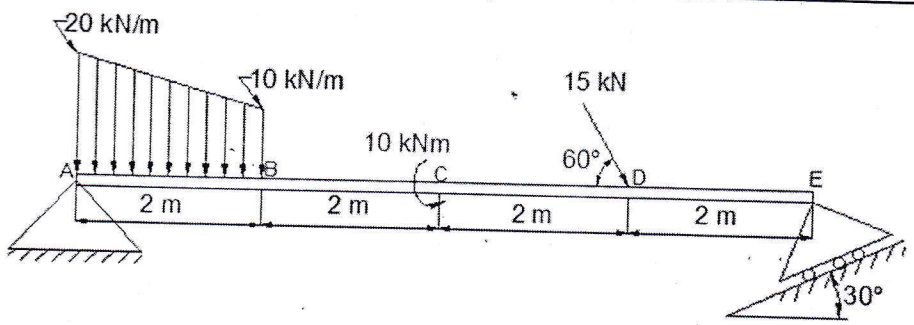
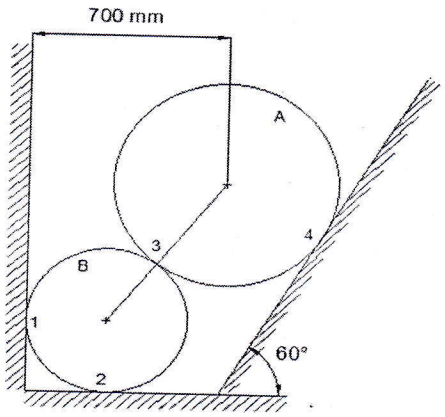
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

April 2026 ~~Nov- Dec 2025~~
(B. Tech.) Program: All Branches Scheme III
Supplementary ~~Regular~~ Examination: FY Semester: I
Course Code: BSC104 and Course Name: Engineering Mechanics
Date of Exam: ~~19-01-2026~~ 13-04-2026 Duration: 02.5 Hours Max. Marks: 60

Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Determine centroid of plane area with respect to E. 	5	2	U
b)	The race car starts from rest and travels along a straight road until it reaches a speed of 42 m/s in 50 second as shown by v-t graph. Determine the distance travelled by race car in 50 second. Draw a-t and s-t graphs. 	5	4	A
c)	An automobile starts from rest and travels on a straight path at 2 m/s^2 for some time. After which it decelerates at 1 m/s^2, till it comes to rest. If the distance covered is 300 m, find the maximum velocity of the automobile and the total time of travel.	5	4	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Find the reactions at A and E for the beam loaded as shown in figure.	10	1	A

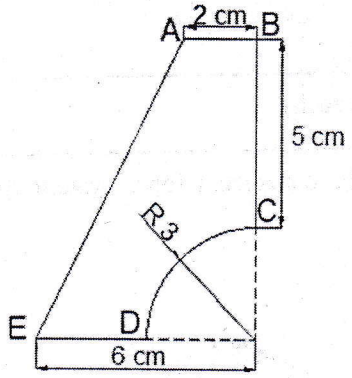
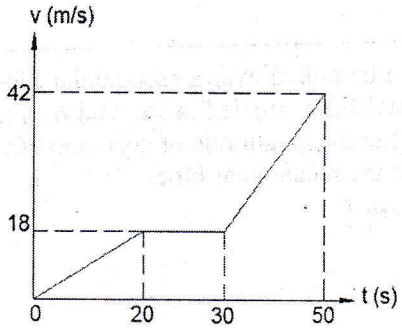
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

April 2026 ~~Nov – Dec 2025~~
(B. Tech.) Program: All Branches Scheme III
Supplementary ~~Regular~~ Examination: FY Semester: I
Course Code: BSC104 and Course Name: Engineering Mechanics
Date of Exam: ~~19-01-2026~~ 13-04-2026 Duration: 02.5 Hours Max. Marks: 60

				
b)	Two spheres A and B of weight 1000 N and 750 N respectively are kept as shown in fig. Determine the reactions at all contact points 1, 2, 3 and 4. Radius of A is 400 mm and radius of B is 300 mm. 	10	1	A
c)	i) The acceleration of a particle in rectilinear motion is given by $a = 100 - 3x^2$ m/s^2. Knowing at t=0, v=0 and x=0 find at what position the velocity is zero.b) the velocity at x=8 m c) at what position the particle acquires maximum velocity.	5	4	A
	ii) A gunman fires a bullet with a velocity of 100 m/s, 50° upwards from the top of a hill 300 m high to hit a bird. The bullet misses its target and finally lands on the ground. Calculate a) the maximum height reached by the bullet above the ground b) total time of flight c) horizontal range of the bullet d) velocity with which the bullet hits the ground.	5	4	A
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Rod BCD is partially guided by roller at C which moves in a vertical track. Knowing that at the instant shown , the angular velocity of AB is 5 rad/s clockwise determine i) angular velocity of rod BD ii) velocity of point D	10	5	A

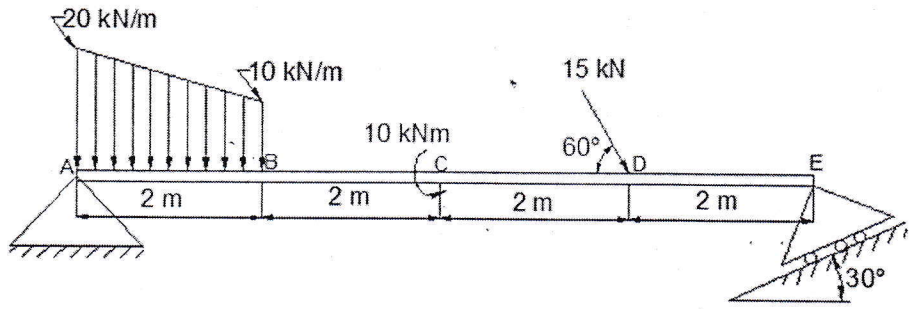
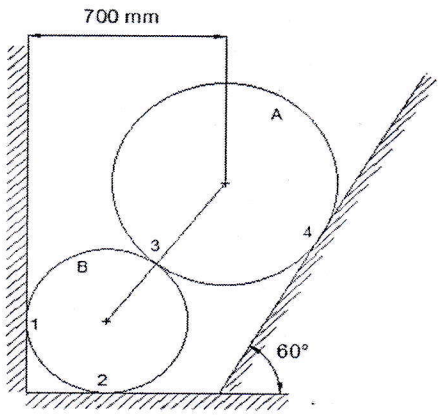
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

April 2026 ~~Nov - Dec 2025~~
(B. Tech.) Program: All Branches Scheme III
Supplementary ~~Regular~~ Examination: FY Semester: I
Course Code: BSC104 and Course Name: Engineering Mechanics
Date of Exam: ~~19-01-2026~~ 13-04-2026 Duration: 02.5 Hours Max. Marks: 60

Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	Determine centroid of plane area with respect to E. 	5	2	U
b)	The race car starts from rest and travels along a straight road until it reaches a speed of 42 m/s in 50 second as shown by v-t graph. Determine the distance travelled by race car in 50 second. Draw a-t and s-t graphs. 	5	4	A
c)	An automobile starts from rest and travels on a straight path at 2 m/s^2 for some time. After which it decelerates at 1 m/s^2, till it comes to rest. If the distance covered is 300 m, find the maximum velocity of the automobile and the total time of travel.	5	4	U
Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	Find the reactions at A and E for the beam loaded as shown in figure.	10	1	A

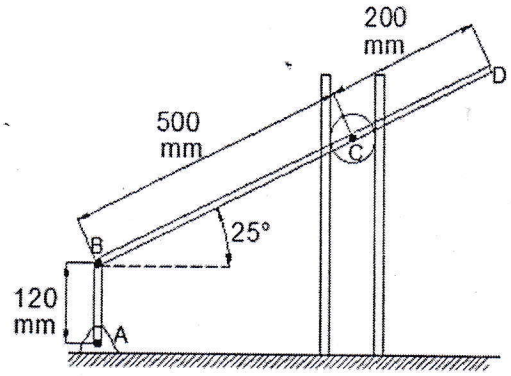
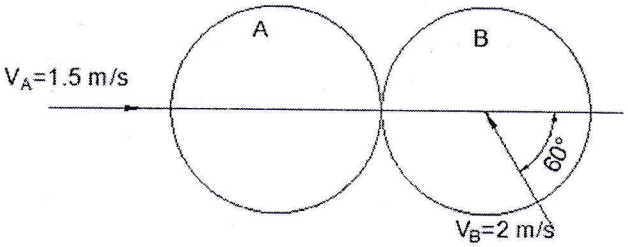
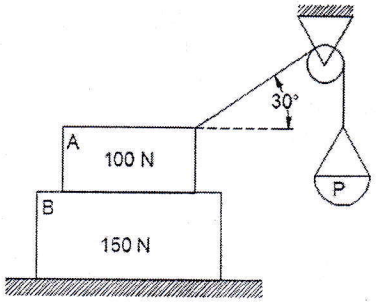
K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

April 2026 ~~Nov – Dec 2025~~
(B. Tech.) Program: All Branches Scheme III
Supplementary ~~Regular~~ Examination: FY Semester: I
Course Code: BSC104 and Course Name: Engineering Mechanics
Date of Exam: ~~19-01-2026~~ 13-04-2026 Duration: 02.5 Hours Max. Marks: 60

				
b)	Two spheres A and B of weight 1000 N and 750 N respectively are kept as shown in fig. Determine the reactions at all contact points 1, 2, 3 and 4. Radius of A is 400 mm and radius of B is 300 mm. 	10	1	A
c)	i) The acceleration of a particle in rectilinear motion is given by $a = 100 - 3x^2$ m/s^2. Knowing at t=0, v=0 and x=0 find at what position the velocity is zero.b) the velocity at x=8 m c) at what position the particle acquires maximum velocity.	5	4	A
	ii) A gunman fires a bullet with a velocity of 100 m/s, 50° upwards from the top of a hill 300 m high to hit a bird. The bullet misses its target and finally lands on the ground. Calculate a) the maximum height reached by the bullet above the ground b) total time of flight c) horizontal range of the bullet d) velocity with which the bullet hits the ground.	5	4	A
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	Rod BCD is partially guided by roller at C which moves in a vertical track. Knowing that at the instant shown , the angular velocity of AB is 5 rad/s clockwise determine i) angular velocity of rod BD ii) velocity of point D	10	5	A

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

April 2026 ~~Nov Dec 2025~~
(B. Tech.) Program: All Branches Scheme III
~~Supplementary Regular~~ Examination: FY Semester: I
Course Code: BSC104 and Course Name: Engineering Mechanics
Date of Exam: ~~19-01-2026~~ 13-04-2026 Duration: 02.5 Hours Max. Marks: 60

				
b)	i) Two billiard balls of equal mass collide with velocities V_A = 1.5 m/s , V_B = 2 m/s. Find the velocity of the balls after impact and loss in kinetic energy. 	7	6	A
	ii) Define impact and any two types of impact in collision.	3	6	U
c)	i) Two blocks A and B are resting as shown in figure. If the coefficient of friction between the ground and block B is 0.1 and between the block B and block A is 0.3. Find the minimum value of weight P in the pan so that motion starts. 	7	3	A
	ii) Define: 1. Angle of repose 2. Cone of friction 3. Angle of friction	3	3	U

****