

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

Subject Code: BSC104

Subject Name: Engineering Mechanics

Date: 25/12/2023

Backlog Examination, Dec 23-24

Program: FY B.Tech. All Branches

Supplementary Examination: FY Semester: I

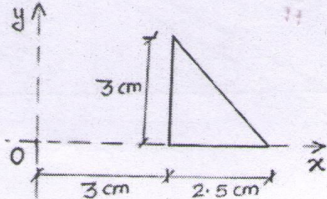
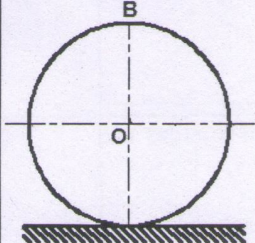
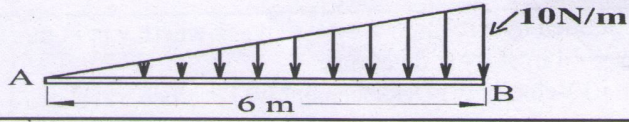
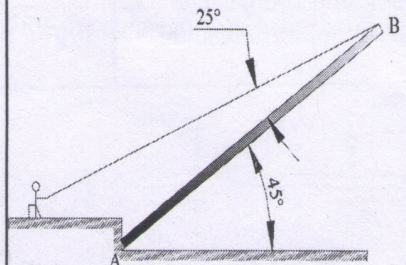
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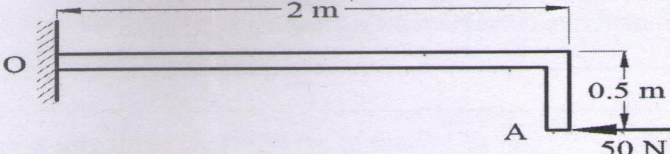
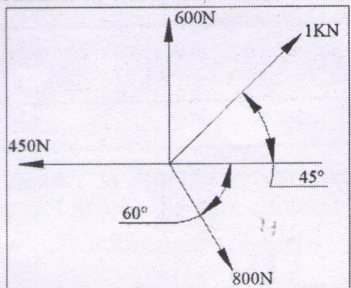
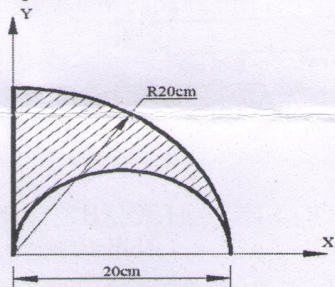
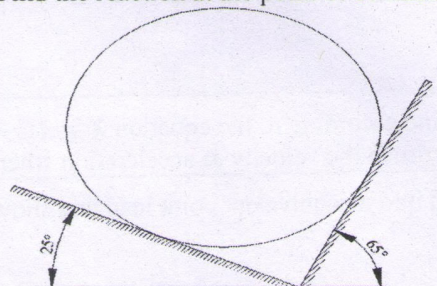
Duration: 2.5 Hours

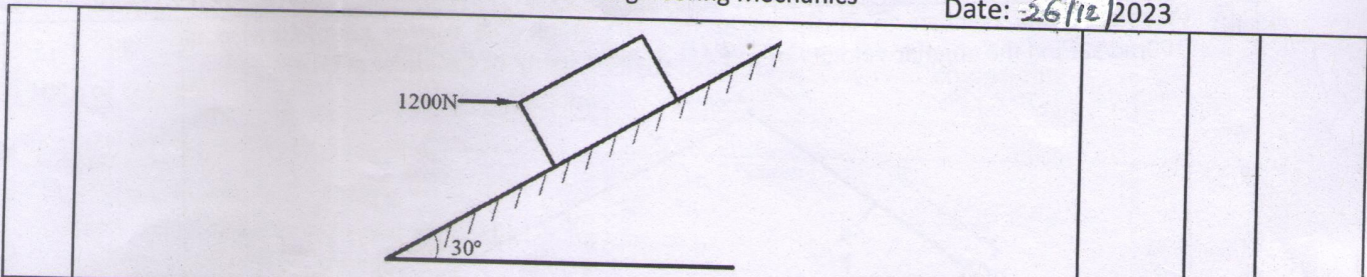
Max. Marks: 60

Instructions:

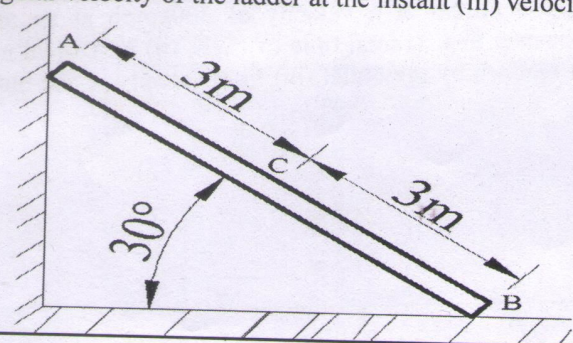
- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q.1	Attempt any six out of eight:-	12		
i)	Write laws of friction.	2	3	A
ii)	Find Centroid for the given plane lamina with respect to X & Y axes. 	2	2	U
iii)	Determine the velocity of point B on the roller rolling at 4 rad/s clockwise. Diameter of roller is 1.5m. 	2	5	R
iv)	A point P moves along a straight line according to the equation $X = 4t^3 + 2t + 5$, where X is in meters, t is in seconds. Determine the velocity & acceleration when t=3 sec.	2	4	A
v)	Convert the uniformly varying load into its equivalent point load and show its point of application. 	2	1	A
vi)	Draw FBD of beam AB shown in figure. 	2	1	An

vii)	State Varignon's theorem.	2	1	
viii)	Find the moment of the 50N force about point O. 	2	1	An
Q.2	Attempt any four out of six:-	16		
i)	Determine analytically the resultant of the four concurrent forces shown in figure. 	4	1	
ii)	Find the centroid of the shaded portion. 	4	2	U
iii)	A smooth circular cylinder of weight 1500N rests in a v-shape groove whose sides are inclined as shown in fig. Find the reaction at the point of contact. 	4	1	A
iv)	The motion of a particle is defined by a relation $v = 4t^2 - 3t - 1$ where v is in m/s and t is in sec. If the displacement $x = -4$ m at $t = 0$, determine At $t = 3$ secs i) Acceleration ii) Velocity iii) Displacement iv) Distance traveled.	4	4	An
v)	A horizontal force of 1200N is applied horizontally on a block weighing 1000N. The coefficient of friction is 0.3. Determine whether the block will be in equilibrium, slide down or move up.	4	3	A



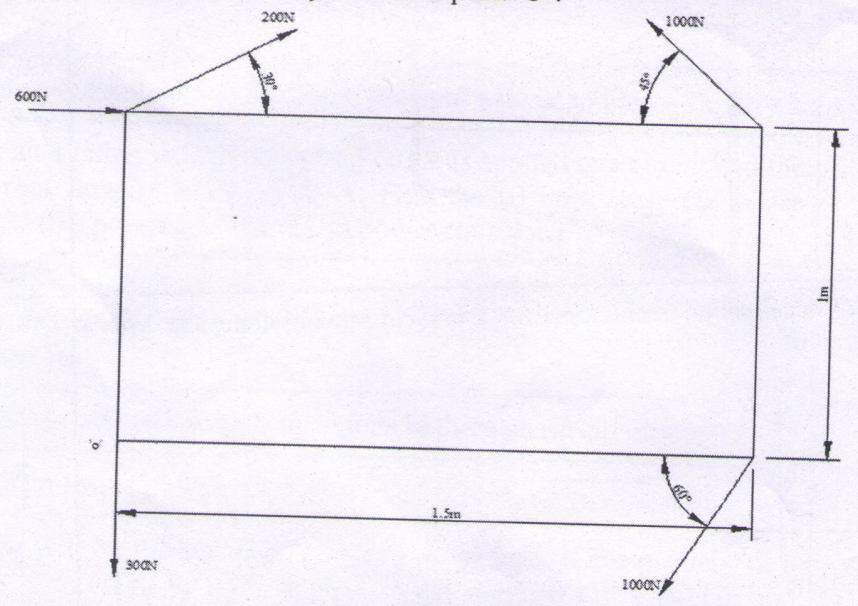
vi) Figure shows a ladder AB = 6m resting against a vertical wall at A & horizontal ground at B. If end B of ladder is pulled towards right with a constant velocity 4m/s, find (i) ICR of ladder (ii) Angular velocity of the ladder at the instant (iii) velocity of end A.



4 5 An

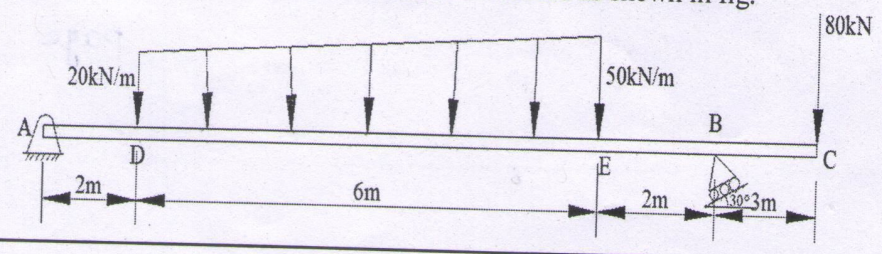
Q.3 Attempt any two out of three:-

i) The rectangular framework is acted upon by a general coplanar force system shown in fig. Determine position & magnitude of the resultant force acting on the framework. What is the moment of the force system about point 'O'?



16
8 1 A

ii) Find the support reactions at A & B for the beam loaded as shown in fig.



8 1 A

iii)	A slider crank mechanism is shown in fig. The crank OA rotates anticlockwise at 100rad/s. Find the angular velocity of rod AB & the velocity of the slider at B.	8	5	An
Q.4 Attempt any two out of three:-		16		
i)	A bullet is fired from a height of 120m at a velocity of 360kmph at an angle of 30° upwards. Neglecting air resistance find (i) total time of flight (ii) horizontal range of the bullet (iii) maximum height reached by the bullet (iv) final velocity of the bullet just before reaching the ground.	8	4	A
ii)	Two cylinders each of diameter 100mm & each weighing 200N are placed as shown in fig. Assuming that all the contact surfaces are smooth find the reactions at A, B & C.	8	1	A
iii)	Fig. shows a plot of acceleration versus time for a particle moving along the X-axis. Draw v- t and s-t graphs.	8	4	An