

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: -14/08/2023

Supplementary Examination August 2022 - 23

Program: FY B.Tech. All Branches

Supplementary Examination: FY Semester: I

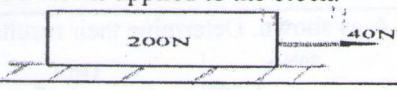
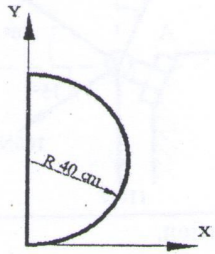
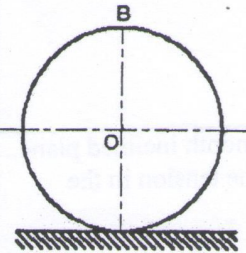
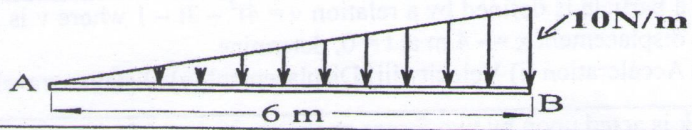
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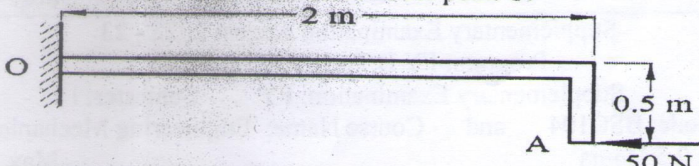
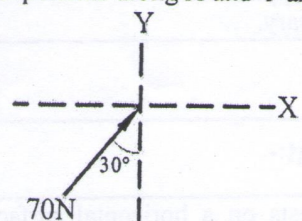
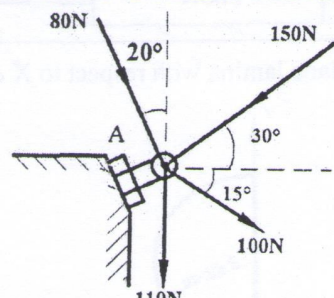
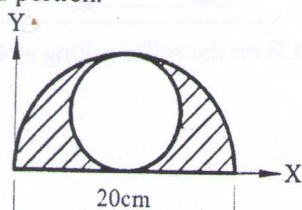
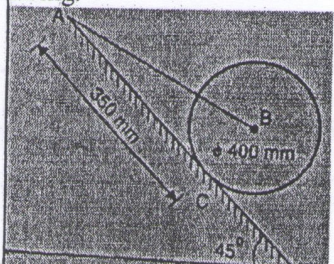
Duration: 2.5 Hours

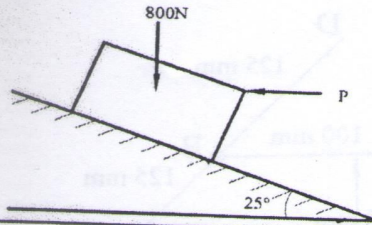
Max. Marks: 60

Instructions:

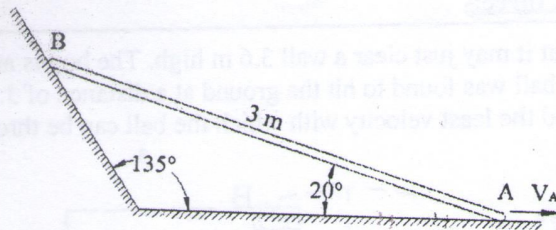
- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q.1	Attempt any six out of eight:-	12		
i)	<p>A block of weight 200N rests on a horizontal surface. The co-efficient of friction between the block & the horizontal surface is 0.4. Find the frictional force acting on the block if a horizontal force of 40N is applied to the block.</p> 	2	1	A
ii)	<p>Find Centroid for the given plane lamina with respect to X & Y axes.</p> 	2	2	U
iii)	<p>Determine the velocity of point B on the roller rolling at 4 rad/s clockwise. Diameter of roller is 1.5m.</p> 	2	4	R
iv)	<p>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.</p>	2	3	A
v)	<p>Convert the uniformly varying load into its equivalent point load and show its point of application.</p> 	2	1	U

vi)	<p>Find the moment of the 50N force about point O.</p> 	2	1
vii)	State Lami's Theorem.	2	1
viii)	<p>Determine the shown force components along X and Y axis.</p> 	2	1
<p>Q.2 Attempt any four out of six:-</p>		16	
i)	<p>Four forces acts on a bolt A as shown. Determine their resultant.</p> 	4	1
ii)	<p>Find the centroid of the shaded portion.</p> 	4	2
iii)	<p>A roller B of weight $W = 5 \text{ kN}$ and 400 mm diameter rests on a smooth inclined plane. It is prevented from rolling down the plane by a string AB. Find the tension in the string.</p> 	4	1
iv)	<p>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 $x = -4 \text{ m}$ at $t = 0$, determine. At $t = 3 \text{ secs}$ i) Acceleration ii) Velocity iii) Displacement iv) Distance traveled.</p>	4	4
v)	<p>A support block is acted upon by two forces as shown. If $\mu = 0.35$, determine the force P required to start the block moving up the plane</p>	4	3



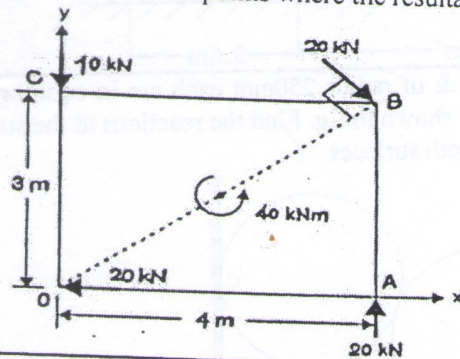
vi) A bar, 3m long slides down the plane shown in figure. The velocity of end A is 3.6 m/s to the right. Determine the angular velocity of AB and velocity of end B at the instant shown.



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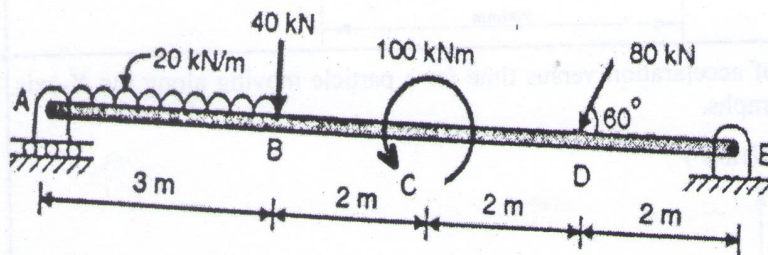
Q.3 Attempt any two out of three:-

i) Find the resultant of the force system acting on a body OABC. Locate the resultant with respect to O. Also find the points where the resultant will cut the X and Y axis.



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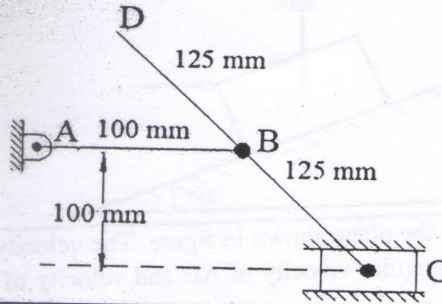
ii) Determine the reactions at hinged support at B and roller support at A as shown in figure.



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iii) At the position shown in the figure, the crank AB has an angular velocity of 3 rad/s clockwise. Find the velocity of the slider C and the point D at the instant shown.

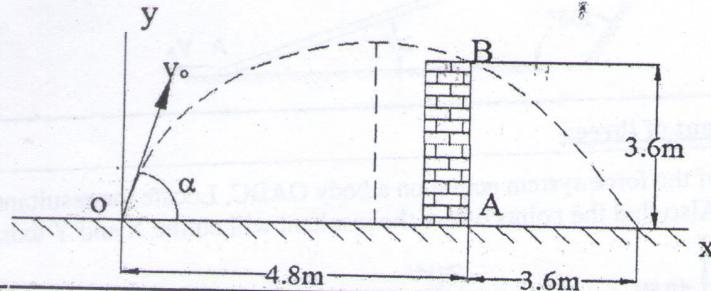
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Q.4 Attempt any two out of three:-

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- i) A boy throws a ball so that it may just clear a wall 3.6 m high. The boy is at distance of 4.8 m from the wall. The ball was found to hit the ground at a distance of 3.6 m on the other side of the wall. Find the least velocity with which the ball can be thrown.

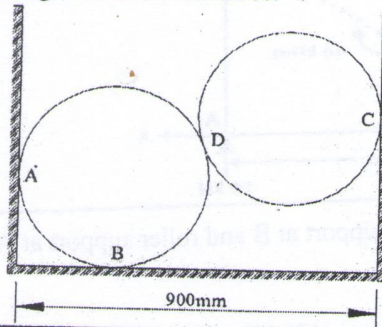


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- ii) Two smooth spheres of weight 100N & of radius 250mm each are in equilibrium in a horizontal channel of width 900mm as shown in fig. Find the reactions at the surfaces of contact A, B, C & D assuming all smooth surfaces.

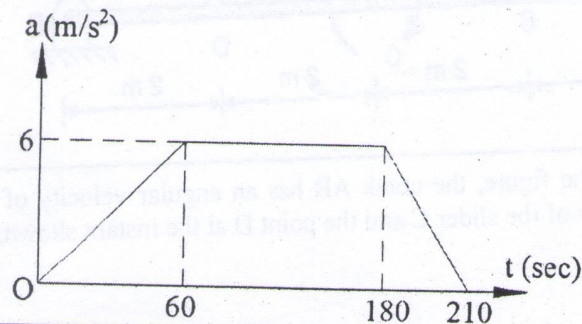


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- iii) Fig. shows a plot of acceleration versus time for a particle moving along the X-axis. Draw v-t and s-t graphs.



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