

K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22

(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

Nov – Dec 2021 (To be conducted in March 2022)

(B.Tech.) Program: FY (All branches)

Examination: FY Semester: I

Course Code: 1UBSC104 and Course Name: Engineering Mechanics

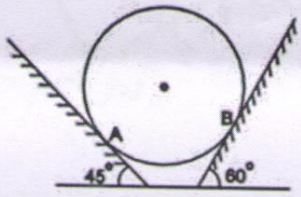
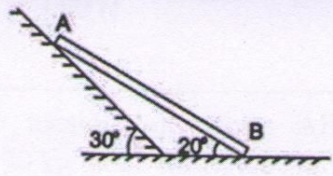
Duration: 03 Hours

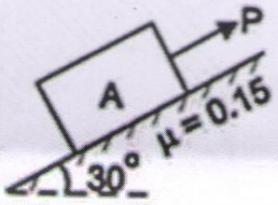
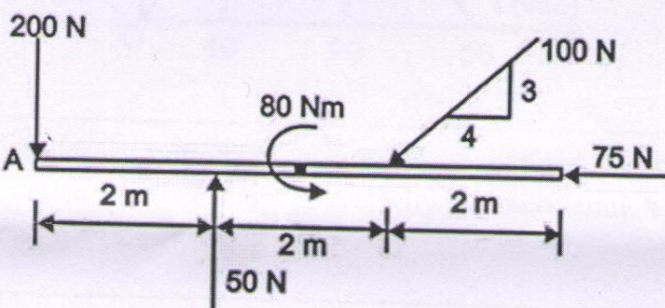
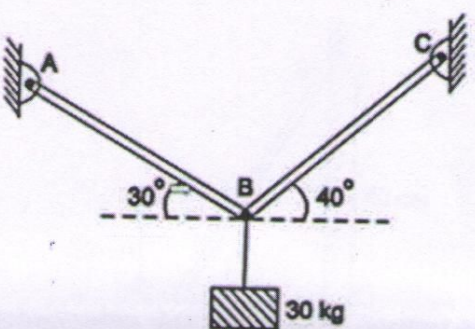
Max. Marks: 60

Instructions:

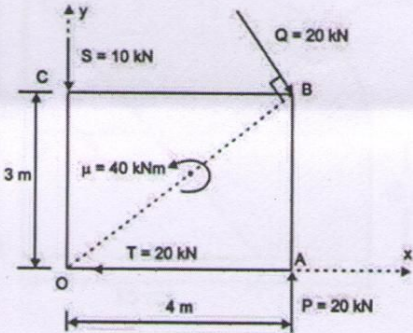
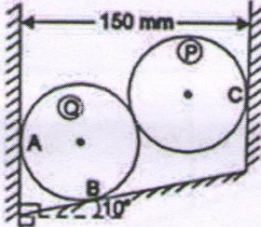
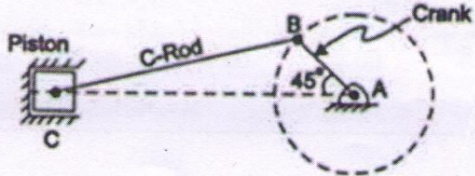
- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data if necessary, and mention the same clearly.
- (4) Figures to the right indicate full marks.
- (5) Take $g=9.81 \text{ m/s}^2$.

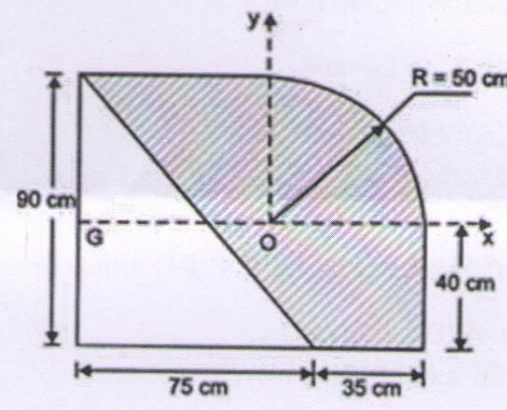
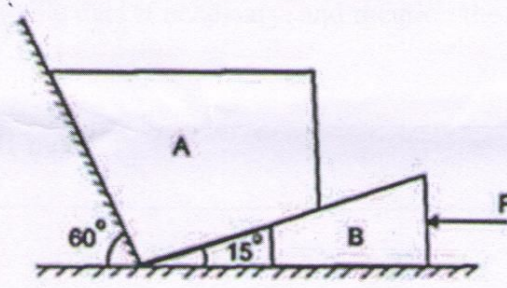
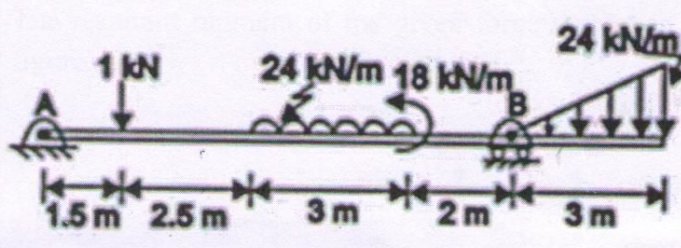
		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight	12		
i)	The resultant moment of the given force system in the figure is-	2	CO1	U

ii)	Find centroidal coordinates of a quarter circle having radius 4 cm.	2	CO2	U
iii)	A cylinder with 1500 N weight is resting in an unsymmetrical smooth groove as shown in figure. Determine the reaction at point of contact 'A'.	2	CO1	U
				
iv)	Find distance travelled by a particle in 18 th second. Take $a=15 \text{ m/s}^2$ and $u=17.5 \text{ m/s}^2$.	2	CO4	U
v)	The limiting frictional force is 5 KN and the normal reaction is 14 KN. Determine coefficient of friction.	2	CO3	U
vi)	Rod AB of length 3 m is kept on a smooth plane as shown in the figure. The velocity of end A is 5 m/s downward along the inclined plane. Locate the ICR.	2	CO5	U
				
vii)	A ball is thrown from horizontal level, such that it clears a wall 6 m high, situated at a horizontal distance of 35 m from point of projection. If the angle of projection is 60° with respect to the horizontal, what should be the minimum velocity of projection?	2	CO4	U

viii)	<p>A block of weight 1000 N is kept on a rough inclined surface. Draw FBD of a block for motion to impend up the plane.</p> 	2	CO3	U
Q.2	Solve any four questions out of six.	16		
i)	<p>Replace the system of forces and couple by a single force couple system at A.</p> 	4	CO1	U
ii)	<p>Determine the tensions in cables AB and BC for equilibrium of 30 kg block for figure shown below.</p> 	4	CO1	U

iii)	Find the centroid of shaded area?	4	CO2	U
iv)	From v-t diagram, find total distance travelled in 50 sec.	4	CO4	U
v)	Rectilinear motion of a particle is defined by the equation $v^3 = x^2$. Determine velocity and acceleration at $x = 8$ m.	4	CO4	U
vi)	A 100 N uniform rod AB is held in position as shown in figure. If the coefficient of friction is 0.15 at all contact points. Calculate minimum value of P for which equilibrium is maintained.	4	CO3	U

Q.3	Solve any two questions out of three.	16		
i)	<p>Find resultant of force system acting on body OABC. Also find the points where the resultant will cut the x and y axis.</p> 	8	CO1	U
ii)	<p>Two identical cylinders of diameter 100 mm and weight 200 N are placed as shown in figure. All contacts are smooth. Find reaction at A, B and C.</p> 	8	CO1	U
iii)	<p>In a crank connected rod mechanism the length of crank and the connecting rod are 300 mm and 1200 mm respectively. The crank is rotating at 180 rpm. Find the velocity of piston, when the crank is at an angle of 45° with the horizontal. Assuming the crank is rotating in clockwise direction.</p> 	8	CO5	U

Q.4	Solve any two questions out of three.	16		
i)	<p>Find the centroid of shaded area?</p> 	8	CO2	U
ii)	<p>Determine the force P required to move block A of weight 5000 N up the inclined plane. Coefficient of friction between all contact surfaces is 0.25. Neglect the weight of the wedge. The wedge angle is 15°.</p> 	8	CO3	U
iii)	<p>Find support reactions at A and B for the beam loaded as shown in figure. A is hinged and B is roller.</p> 	8	CO1	U