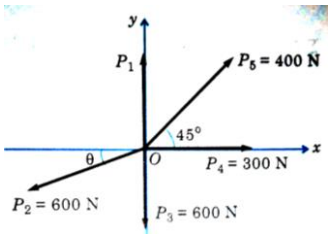
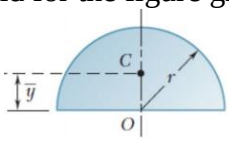
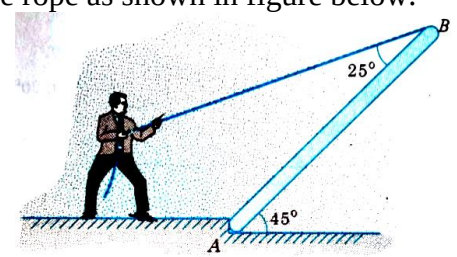
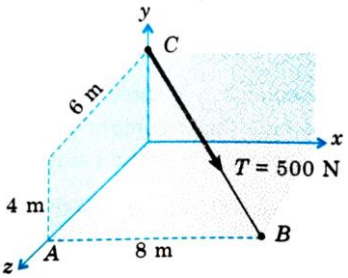
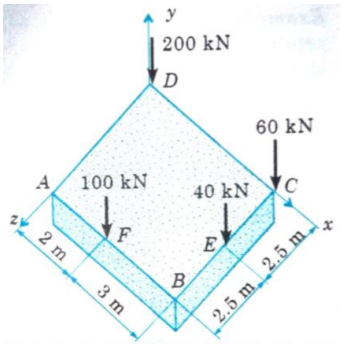
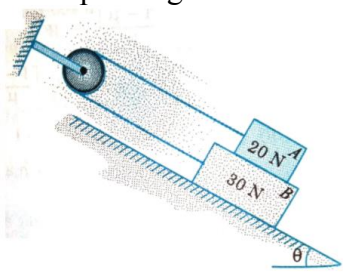
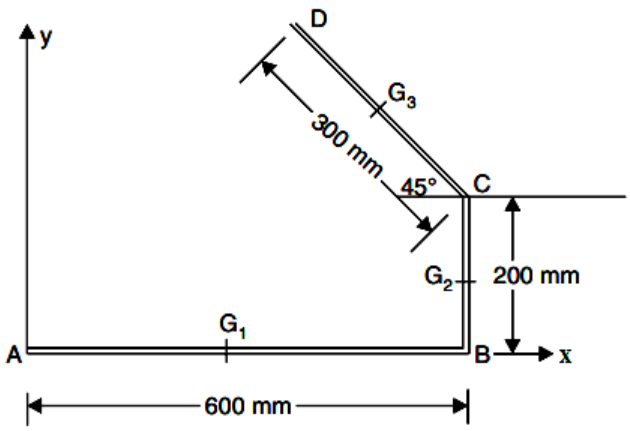
SOMAIYA VIDYAVIHAR UNIVERSITY

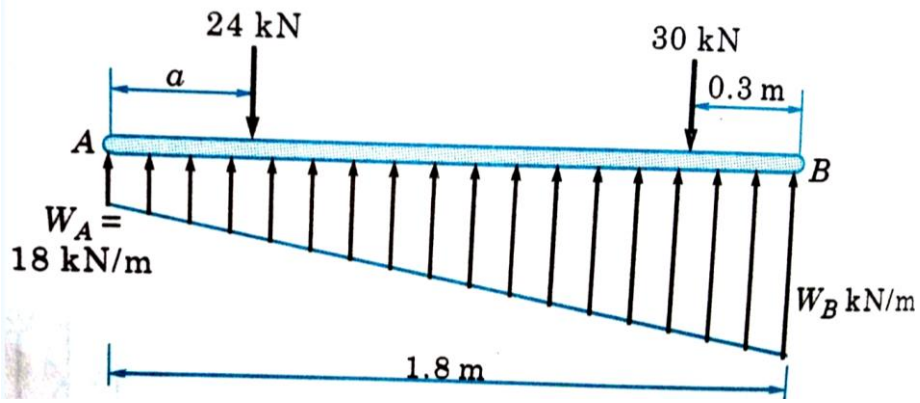
Semester: February 2021 –May 2021 **Examination: ESE Examination**		
Programme code: 01 **Programme: B.TECH**	**Class:** FY	**Semester:** I/ II **(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**		**Name of the Department:** All
Course Code: 116U06C104	**Name of the Course: Engineering Mechanics**	
Duration : 1 Hour 45 Minutes	**Maximum Marks : 50**	
Instructions: **1) Draw neat diagrams** **2) Assume suitable data if necessary**		

Question No.		Max Marks
Q1 (A)	Answer the following 1. Lami's theorem can be applied to a) two concurrent forces b) three concurrent forces c) three parallel forces d) any number of forces 2. If the resultant of five forces acting at point O (Refer following figure) is zero, then angle θ will be  a) 15.15º b) 12.26º c) 90º d) 13.74º 3. The Y coordinate of centroid for the figure given below is,  a) 4r/3Π b) Πr^2/4 c) 0 d) r 4. The coefficient of friction represents the ratio of a) frictional force to the normal reaction b) normal reaction to the frictional force c) mass to the normal reaction d) mass to the frictional force	10

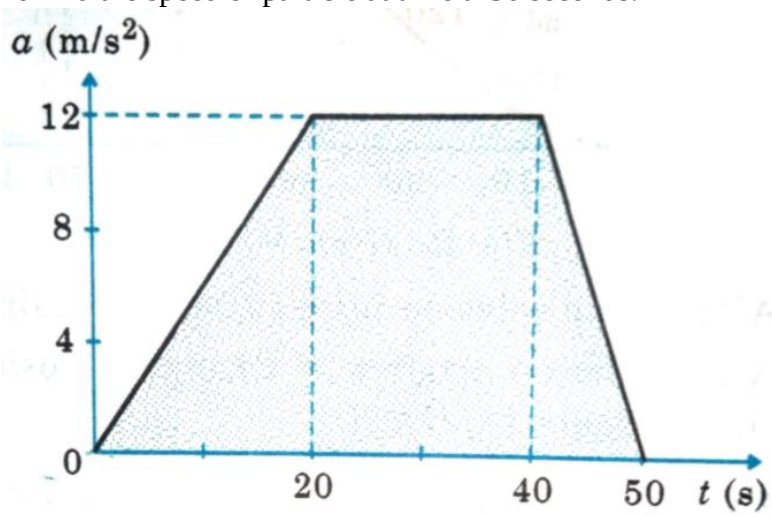
	5. A goods train travels at $v = 20[1 - e^{-t}]$ m/s, where t is time in seconds. The acceleration of train at time 3 sec will be a) 1.27 m/s^2 b) 0.996 m/s^2 c) 0.867 m/s^2 d) 0.776 m/s^2 6. A car is travelling along a circular curve that has a radius of curvature of 50 m. If the speed of the car is 16 m/s and is increasing uniformly the rate of 8 m/s^2. The normal component of acceleration is a) 8 m/s^2 b) 2 m/s^2 c) 5.12 m/s^2 d) 9.5 m/s^2 7. The motion of the particle with respective to moving reference is called as a) absolute motion b) projectile motion c) uniform motion d) relative motion 8. If we add _____ to the system of forces then the state of equilibrium is created which is called dynamic equilibrium. a) weight force b) resultant force c) parallel force d) D'Alembert's force 9. The work done by external force is positive if the displacement is a) opposite to the direction of applied force b) in the direction of applied force c) zero d) against gravity 10. The energy is conserved and there will be no loss of kinetic energy in case of a) plastic impact b) semi-elastic impact c) elastic impact d) always	
Q1 (B)	Attempt **any FIVE** questions out of the following (any 5 out of 7) 1. A man raises a 10 kg joist of length 4 m by pulling on a rope. Find the tension T in the rope as shown in figure below.  2. List the different types of system of forces and explain any one of them. 3. Derive an equation for law of conservation of momentum.	10

	4. A car starts from rest on a curved road of radius 250 m and accelerates at a constant tangential acceleration of 0.6 m/s^2. Determine the velocity of car before the magnitude of the total acceleration attained by it becomes 0.75 m/s^2. 5. Explain the concept of work of spring. Also explain when it will be positive and when it will be negative. 6. Determine the components of the force exerted at C as shown in the figure if the tension in the cable BC is 500 N.  7. A square foundation mat supports the four columns as shown in figure. Determine the magnitude of resultant of four loads. 	
Q. 2	20 N block A and 30 N block B are supported by an incline plane which is held in position as shown in figure. Knowing that the coefficient of friction is 0.15, between the two blocks and zero between block B and incline, determine the value of θ for which motion is impending. 	10
Q. 3	Solve **any two** of following (5 marks each) a. Determine the centroid of the wire as shown in the figure. 	10

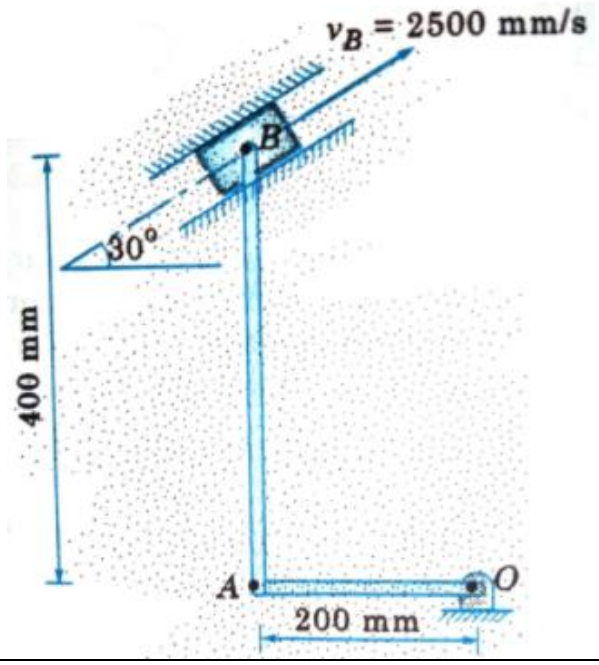
b. The beam AB supports two concentrated loads and rests on the soil which exerts a linearly distributed reaction as shown in the figure. If W_A = 18 kN/m, determine the distance a and the corresponding value of W_B in kN/m.

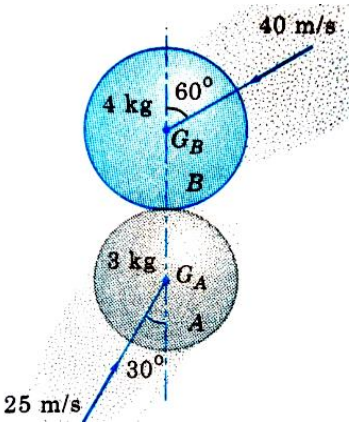
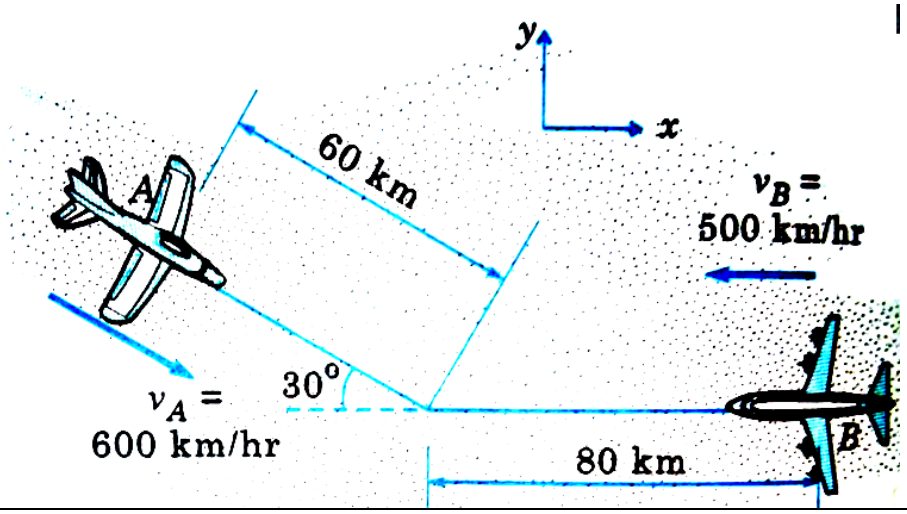


c. Figure shows a-t diagram for a particle moving along x-axis. Draw v-t diagram and find the speed of particle at time t=50 seconds.



d. For the link and slider mechanism shown in figure, locate the instantaneous centre of rotation of link AB. Find also the angular velocity of link OA.



Q. 4	Two smooth balls of mass A 3kg and ball B of mass 4kg are moving with velocities 25m/s and 40 m/s respectively at an angle of 30º and 60º with the vertical as shown in figure. If the coefficient of restitution between two balls is 0.8, find the magnitude and direction of velocities of these balls after impact.  **OR** Planes A and B are flying at the same altitude. If their velocities are V_A = 600 kmph and V_B = 500 kmph when the angle between their straight line course is 30º as shown. Determine the velocity of plane A with respect plane B. Also determine the distance between them in t=5 min.  	10