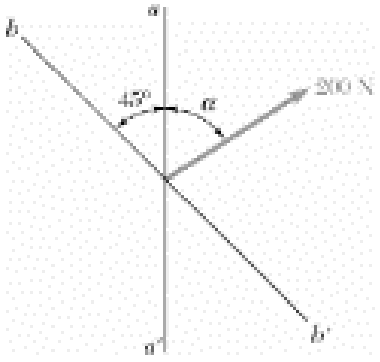
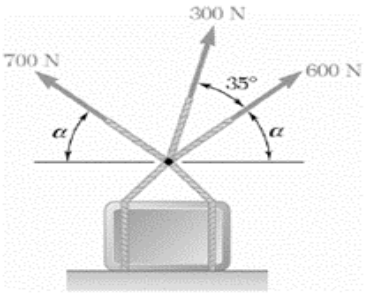
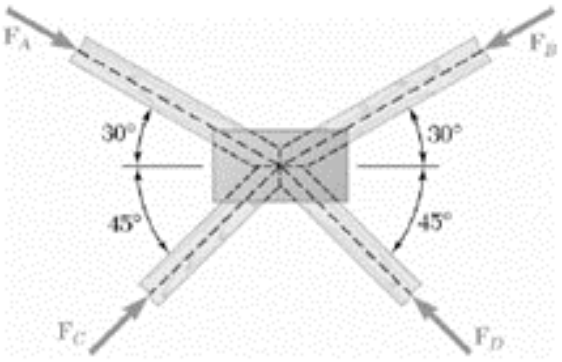
Semester End Examinations (SEE) 2020-21 Odd Semester

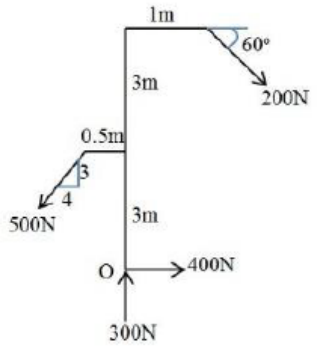
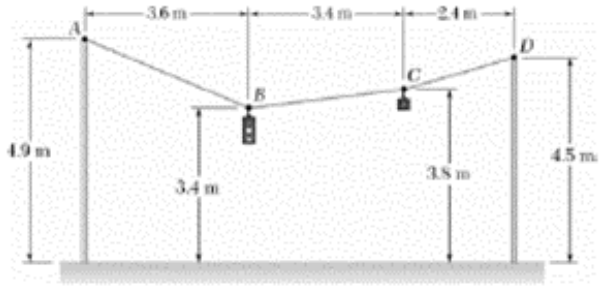
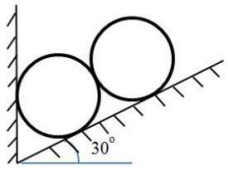
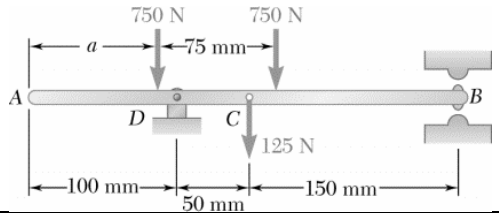
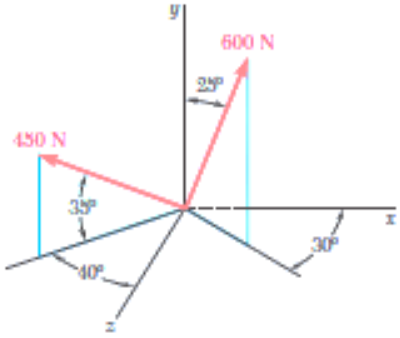
Model Question Paper-1

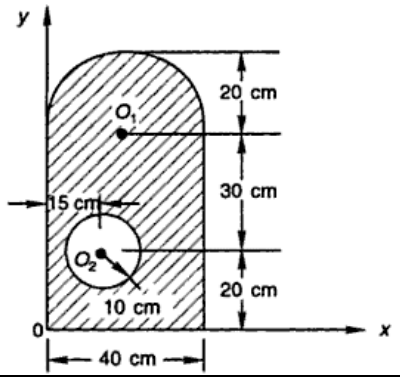
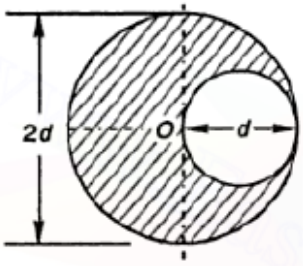
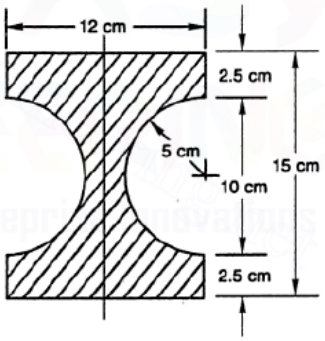
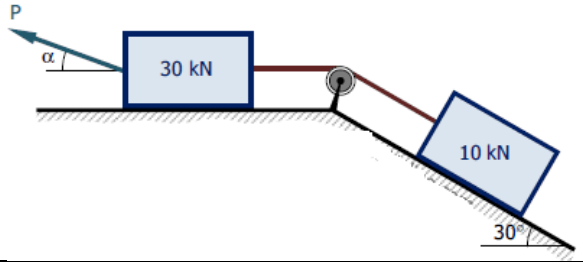
Engineering Mechanics **Course code: 20CIV14**

Semester: I **Duration: 3 Hours**

Note: Answer any five full questions selecting at least one from each Module

Module-1			
1	a	Define the Following. i) Particle ii) Rigid Body iii) Continuum iv) Force	8
	b	The 200 N force is to be resolved into components along lines a-a' and b-b'. Determine the angle α knowing that the component along b-b' is to be 120 N. What is the corresponding value of the component along a-a'? 	6
	c	Discuss the engineering fields where each Newton's laws are more applicable with examples	6
OR			
2	a	For the system of forces shown in figure find the required value of α if the resultant is to be vertical and the corresponding magnitude of the resultant 	4
	B	Four wooden members are joined with metal plate connectors and are in equilibrium under the action of the four forces shown. Knowing that F_A = 2.3 kN and F_B = 2.1 kN, determine the magnitudes of the other two forces 	8

	c	Determine the resultant of the four forces acting on a body as shown in Fig. with respect to point "O" 	8
		Module-2	
3	a	Two traffic signals are temporarily suspended from a cable as shown. Knowing that the signal at B weighs 300 N, determine the weight of the signal at C 	10
	b	Find the reaction at the contact surface for two identical cylinders weighing 1000N each as shown in Fig 	6
	c	Classify the loads considered in the design of structures with neat sketches	4
		OR	
4	a	For the beam and loading shown, determine the range of values of the distance *a* for which the reaction at *B* does not exceed 250 N downward or 500 N upward 	10
	b	Explain the necessary equations of equilibrium for the analysis of structures in space.	4
	C	Determine (*a*) the *x*, *y*, and *z* components of the 600-N force, (*b*) the angles ϑx, ϑy, and ϑz that the force forms with the coordinate axes. 	6

		Module 3	
5	a	Locate the centroid of a given composite area shown in Fig. 	14
	B	From a circular are of diamter 2d, a smaller circle of diamter d is shown in Fig. . Locate the centroid of the remaining area 	06
		OR	
6	a	The cross-section of a cast iron beam is shown in Fig. Determine the moment of Inertia about the centroidal axix 	14
	b	What is the relative significance of the moment of inertia and the radius of gyration? Under what circumstances is it desirable to have small and large values of the moment of inertia?	06
		Module 4	
7	a	Find the least value of P required to cause the system of blocks shown in Fig. to have impending motion to the left. The coefficient of friction under each block is 0.20. 	10
	b	A uniform ladder 4.8 m long and weighing W N is placed with one end on the ground and the other against a vertical wall. The angle of friction at all contact surfaces is 20°. Find the minimum value of the angle θ at which the ladder can be inclined with the horizontal before slipping occurs.	10
		OR	

8	a	Distinguish between Static friction and kinetic friction	4
	b	Explain the stress-strain curve of a mild steel with salient features.	8
	c	Exaplin the significance of different mechanical properties of engineering materials.	8
Module 5			
9		A stone is dropped into well and the splash of sound is heard after 9 seconds. Determine the height of drop from the water surface. Assume velocity of sound to be 330 m/sec.	8
		Two cars P and Q accelerated from a standing start. The acceleration of P is 1.3 m/s^2 and that of Q is 1.6 m/s^2 . If Q was originally 6 m behind P, how long it takes to overtake P?	8
		State D'Alembert's principle and mention its applications in Plane Motion.	4
OR			
10		An aircraft moving horizontally at 120 km/h speed at an elevation of 1200m targets a point on the ground and releases a bomb which hits it. Determine the horizontal distance of the aircraft (position when it releases the bomb) from the target. Also calculate the velocity and direction with which bomb hits the target.	12
		A particle, starting from rest, moves in a straight line, whose equation of motion is given by $s=5t^3-3t^2+6$. Find the displacement, velocity, and acceleration of the particle after 5 seconds.	10