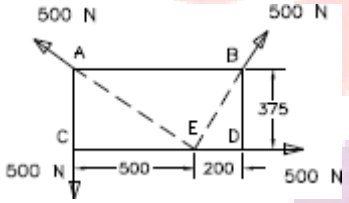
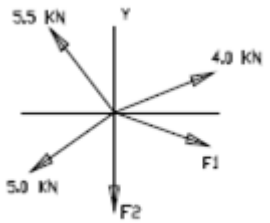
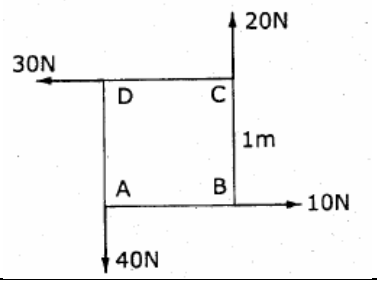
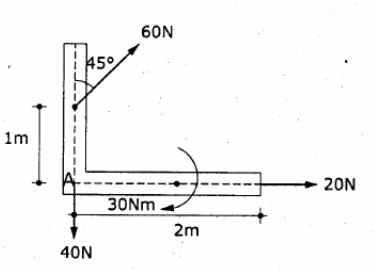
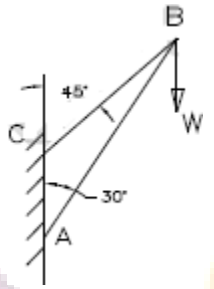
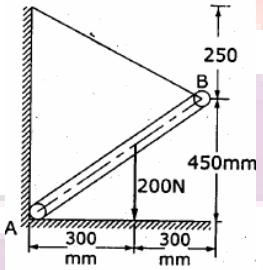
VIII. Unit wise Question Bank

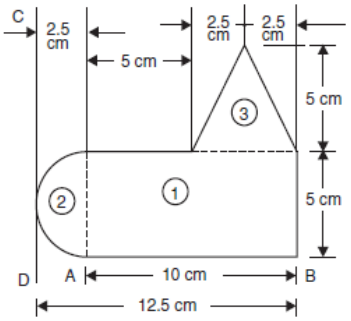
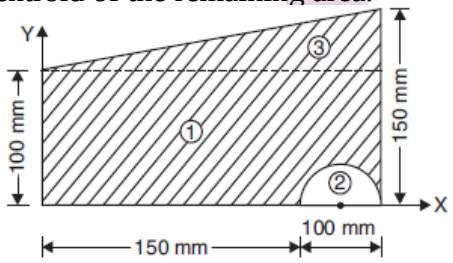
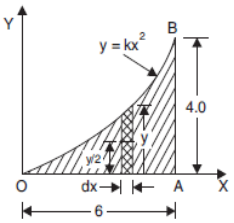
Unit-I

Part – A (Short Answer Questions)				
1	Define the terms (a). coplanar forces (b) concurrent forces	L1	CO1	PO1,PO3
2	State parallelogram law of forces	L1	CO1	PO1,PO3
3	State varignon's theorem	L1	CO1	PO1,PO3
4	Define law of transmissibility of forces with a neat sketch	L1	CO1	PO1,PO3
5	Define couple? What is a moment of a couple?	L1	CO1	PO1,PO3
6	Explain the significance of a free body diagram	L1	CO1	PO1,PO3
7	Distinguish between a resultant force and equilibration force.	L2	CO1	PO1,PO3
8	State the analytical conditions for equilibrium of coplanar forces in a plane.	L1	CO1	PO1,PO3
9	State Lami's theorem.	L1	CO1	PO1,PO3
10	Determine the resultant of an 800N force acting towards eastern direction and a 500N force actingtowards north eastern direction	L3	CO1	PO1,PO3
Part – B (Long Answer Questions)				
11	Four forces act on a 700mm X 375mm plate as shown in fig. a) Determine the resultant of these forces b) Locate the two points where the line of action of the resultant intersects the edge of plate. 	L3	CO1	PO1,PO3
12	The forces shown in the figure below are in equilibrium. Determine the forces F1 and F2 	L3	CO1	PO1,PO3
13	Four forces act on a square of side 1 m as shown in fig. Reduce the force system into an equivalent force – couple system at A. 	L3	CO1	PO1,PO3

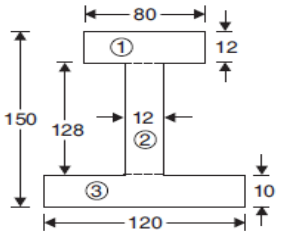
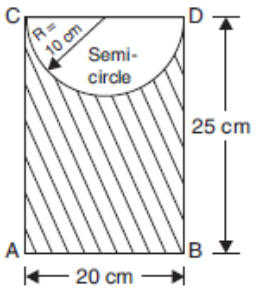
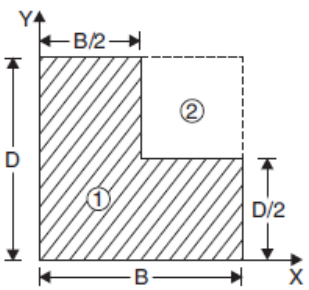
14		Reduce the system of forces shown in fig.5 to a force – couple system at A  Fig.5	L3	CO1	PO1,PO3
15		A crane shown in figure is required to lift a load of W=10 KN. Find the forces in themembers AB and CB 	L3	CO1	PO1,PO3
16		A rod AB of weight 200 N is supported by a cable BD and the corner of wall and floor surface as shown in fig. Find the reaction at A and tension in the cord. 	L4	CO1	PO1,PO3

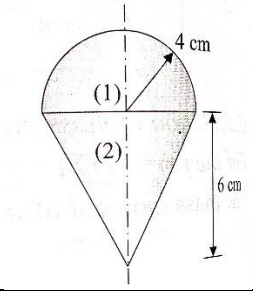
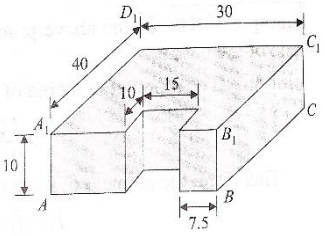
UNIT–II

S.No.	Questions	BT	CO	PO
	Part – A (Short Answer Questions)			
1	Explain the friction with types. And Distinguish between static friction and kinetic friction	L2	CO2	PO2,PO4
2	Is it possible to eliminate the friction completely from mechanical parts in machines? Discuss.	L4	CO2	PO2,PO4
3	Define angle of friction, angle of repose and cone of friction	L1	CO2	PO2,PO4
4	Define limiting and impending friction.	L1	CO2	PO2,PO4
5	Define ladder friction and discuss the sense the frictional forces acting at the contact points.	L2	CO2	PO2,PO4
6	Distinguish between centre of gravity and centroid	L4	CO2	PO2,PO4
7	Explain how to choose the axes of reference, while determining the coordinates of the centroid?	L2	CO2	PO2,PO4
8	If an area has two axes of symmetry then where does the centroid lie?	L3	CO2	PO2,PO4
9	Can the centroid of a volume coincide with the centroid of its cross section? Explain.	L3	CO2	PO2,PO4
8	State Pappus theorem	L2	CO2	PO2,PO4
9	Define surface of revolution and volume of revolution	L1	CO2	PO2,PO4
10	Under what condition does center of mass coincide with the center of gravity	L3	CO2	PO2,PO4

Part – B (Long Answer Questions)					
11		A man wishing to slide a stone block of weight 1000 N over a horizontal concrete floor, ties a rope to the block and pulls it in a direction inclined upward at an angle of 20° to the horizontal. Calculate the minimum pull necessary to slide the block if the co-efficient of friction μ = 0.6. Calculate also the pull required if the inclination of the rope with the horizontal is equal to the angle of friction and prove that this is the least force required to slide the block.	L2	CO2	PO2,PO4
12		A block over lying a 10° wedge on a horizontal floor and leaning against a vertical wall and weighing 1500 N is to be raised by applying a horizontal force to the wedge. Assuming co-efficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force to be applied to raise the block.	L3	CO2	PO2,PO4
13		A screw-jack is used to lift a load of 5 kN. The jack has screw with square threads having two threads per 12 mm length. If the co-efficient of friction between the nut and the screw is 0.08 and outer dia. of the screw is 60 mm, find the force required at the end of the 600 mm long lever to lift the load.	L3	CO2	PO2,PO4
14		Using the analytical method, determine the centre of gravity of the plane uniform lamina shown in Fig. 	L3	CO2	PO2,PO4
15		A semi-circular area is removed from the trapezoid as shown in Fig. Determine the centroid of the remaining area. 	L3	CO2	PO2,PO4
16		Determine the co-ordinates of the C.G. of the area OAB shown in Fig., if the curve OB represents the equation of a parabola, given by $y = kx^2$ in which OA = 6 units and AB = 4 units. 	L4	CO2	PO2,PO4

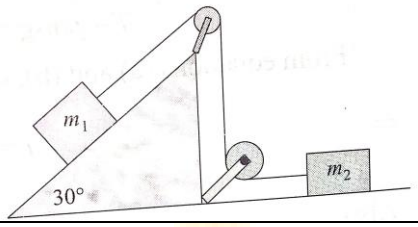
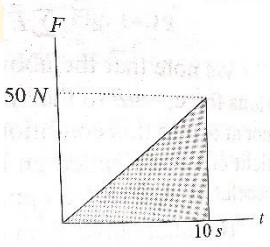
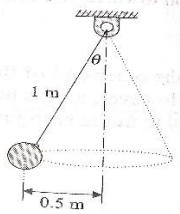
Unit-III

S.No.	Questions	BT	CO	PO
	Part – A (Short Answer Questions)			
1	Differentiate between first and second moment of an area	L2	CO3	PO1,PO3
2	Moment of inertia gives a measure of resistance to bending in the case of sections or plane areas. Discuss.	L3	CO3	PO1,PO3
3	Differentiate between polar moment of inertia and product of inertia.	L3	CO3	PO1,PO3
4	Product of inertia for sections with an axis of symmetry is zero. Explain.	L3	CO3	PO1,PO3
5	Define principal axes and principal moments of inertia	L1	CO3	PO1,PO3
6	Define mass moment of inertia and explain transfer formula for mass moment of inertia.	L1	CO3	PO1,PO3
7	Define of radius of gyration for mass moment of inertia	L1	CO3	PO1,PO3
8	State the relationship between the area moment of inertia and mass moment of inertia for thin uniform plate.	L2	CO3	PO1,PO3
9	Derive the expression for the moment of inertia of a cylinder of length l, radius r and density ρ about the horizontal centroidal axis and about the centroidal transverse axis.	L2	CO3	PO1,PO3
10	Show that the moment of inertia of a thin circular ring of mass M and mean radius R with respect to its geometric axis is MR^2.	L2	CO3	PO1,PO3
	Part – B (Long Answer Questions)			
11	Determine the polar moment of inertia of I-section shown in Fig. 	L3	CO3	PO1,PO3
12	Find the moment of inertia of the area shown shaded in Fig., about edge AB. 	L3	CO3	PO1,PO3
13	Find the moments of inertia about the centroidal XX and YY axes of the section shown in Fig. 	L3	CO3	PO1,PO3
14	Derive the expression for Mass Moment of Inertia of a Right Circular Cone of Base Radius R, Height H and Mass M about its Axis.	L3	CO3	PO1,PO3

15		A toy top made up of wood as a hemispherical portion of 8cm diameter and cone of 6cm height as shown. Determine the mass moment of inertia of the top about the axis of revolution, if density of the material is 75kg/m^3. 	L3	CO3	PO1,PO3
16		From the prism of dimensions 40cmX30cmX10cm, a block of dimensions 10cmX15cmX10cm is removed as shown. Determine the mass moment of inertia of the remaining block about axis CC_1 and AA_1. Take density of material to be 1250kg/m^3. 	L3	CO3	PO1,PO3

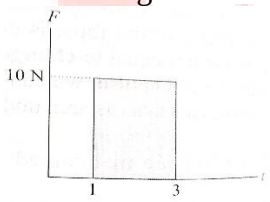
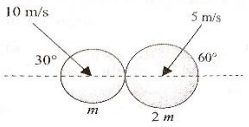
UNIT–IV

S.No.	Questions	BT	CO	PO
	Part – A (Short Answer Questions)			
1	Explain the types of motion with suitable examples.	L3	CO4	PO1,PO2
2	State the differential equations of motion.	L1	CO4	PO1,PO2
3	Mention the assumptions made for the projectile motion.	L2	CO4	PO1,PO2
4	Derive the expressions for (i) time of flight (ii) range when a particle is projected on an inclined plane	L2	CO4	PO1,PO2
5	Define range of projectile and the condition for maximum range.	L1	CO4	PO1,PO2
6	Distinguish between kinematics and kinetics	L2	CO4	PO1,PO2
7	State D'Alembert's principle.	L1	CO4	PO1,PO2
8	Derive mathematical expression for Newton's second law of motion.	L2	CO4	PO1,PO2
9	Discuss the forces providing the normal acceleration in circular motions considering various examples.	L3	CO4	PO1,PO2
10	A stone is dropped into a well and the sound of splash is heard after 4seconds. Assuming the velocity of sound to be 350m/s find the depth of the well.	L3	CO4	PO1,PO2
	Part – B (Long Answer Questions)			
11	The motion of a particle in rectilinear motion is defined by the relation $x=t^3-8t^2+16t-5$, where x and t are represented in meters and seconds respectively. Determine (i) the instants when velocity is zero, (ii) the position and acceleration at those instants of time, (iii) the instant when acceleration is zero, (iv) the position, the displacement and the total distance travelled when the acceleration is zero.	L3	CO4	PO1,PO2
12	The driver of the car moving at the constant speed of 36kmph sees the signal turning red when he is 50m from the signal. The reaction time of the driver i.e., the time interval between the perception of a signal to stop and the application of brakes is	L2	CO4	PO1,PO2

		0.7s. If the car begins to decelerate at a constant rate upon the application of brakes, determine (i) the minimum deceleration of the car required to bring it to a halt just before the signal, (ii) time taken to bring the car to a halt.			
13		A bus moving along a curved road with a constant speed of 45kmph decelerates at a constant rate to a halt in 10secs. Determine a total acceleration at the instant the brake is applied. Radius of curvature is 100m.	L3	CO4	PO1,PO2
14		Find the expressions for the acceleration of the system shown in fig. and the tension in the string. If m_1=2kg, m_2=1kg, $\theta=30^0$ and μ=0.2 for all contact surfaces, determine the pulleys and masses and friction less and the string is inextensible. 	L3	CO4	PO1,PO2
15		A block of 10kg mass resting on the smooth horizontal plane is acted on by a horizontal force F that varies with time as shown in fig. determine the velocity and displacement of the block just after 10sec. 	L3	CO4	PO1,PO2
16		A body of 3kg mass is suspended by an extensible string of 1m length. It is rotated in a circular path of 0.5m radius as shown in fig. Determine the tension in the string and the constant speed of the body. 	L3	CO4	PO1,PO2

UNIT–V

S.No.	Questions	BT	CO	PO
	Part – A (Short Answer Questions)			
1	Define work done on a body (a) by a constant force, and (b) by a varying force.	L1	CO5	PO1,PO4
2	Under what conditions does the work upon a body become zero?	L2	CO5	PO1,PO4
3	Derive the expression for work done upon stretching a spring without accelerating it.	L2	CO5	PO1,PO4
4	State work-energy principle	L1	CO5	PO1,PO4
5	Show that the energy of a freely falling body id constant.	L3	CO5	PO1,PO4
6	Differentiate between impulsive force and impulse of a force	L2	CO5	PO1,PO4
7	Discuss the effect of an impact of jet of water on plates or vanes and where they find application.	L4	CO5	PO1,PO4
8	Derive the expression for a mass of water striking an obstruction	L2	CO5	PO1,PO4
9	Differentiate between work-energy and impulse-momentum	L2	CO5	PO1,PO4

		methods.			
10		State co efficient of restitution	L1	CO5	PO1,PO4
Part – B (Long Answer Questions)					
11		Determine the work done by the force of gravity on a body of kg mass as (i) it falls vertically downwards through a distance of 3m, and (ii) as it slides down an inclined plane with a slope of 0.75. What do you infer from the result?	L3	CO5	PO1,PO4
12		A body of mass 5kg is tied to an inextensible string. Determine the work done by the external agent on the body, if (i) it is lowered down at a constant speed through a distance of 3m, (ii) if it is lowered down at a constant acceleration of $1m/s^2$ through the same distance, (iii) if it is lifted up at a constant velocity by a distance of 3m, (iv) if it is lifted up at a constant acceleration of $1m/s^2$ by the same distance.	L3	CO5	PO1,PO4
13		A block of 5kg mass slides down an inclined plane from rest. How far along the horizontal plane, will it reach before coming to rest? The coefficient of kinetic friction between the block and the inclined plane is 0.15 and that between block and the horizontal plane is 0.2	L3	CO5	PO1,PO4
14		A force acting on a body of 2kg mass for a short duration varies with time as shown. Determine the final velocity of the body after 3seconds, if the body is initially (i) at rest, (ii) moving with a velocity of 5m/s in the positive *x* direction, and (iii) moving with a velocity of 5m/s in the negative *x* direction. 	L3	CO5	PO1,PO4
15		A ball of 100g mass is projected up with a velocity of 20m/s. It hits a ceiling that is 10m above the point of projection. If e=3/4, determine the speed of ball as it descends to the point of projection. If the impact duration is $1/150^{th}$ of a second, determine the impulsive force.	L3	CO5	PO1,PO4
16		A smooth sphere moving at 10m/s in the direction shown collides with another smooth sphere of double its mass and moving with 5m/s in the direction shown. If the coefficient of restitution is 2/3, determine their velocities after collision. 	L3	CO5	PO1,PO4