I B. Tech II Semester (R19) Regular Examinations
ENGINEERING MECHANICS
(MECHANICAL ENGINEERING)
MODEL QUESTION PAPER

TIME: 3Hrs. **Max. Marks: 75 M**

Answer **ONE Question** from **EACH UNIT.**
All questions carry equal marks.
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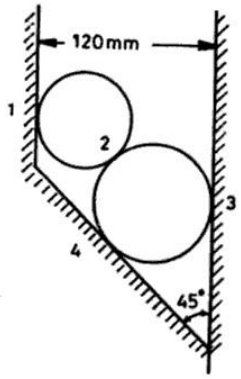
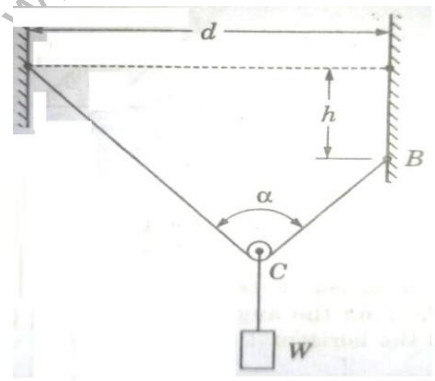
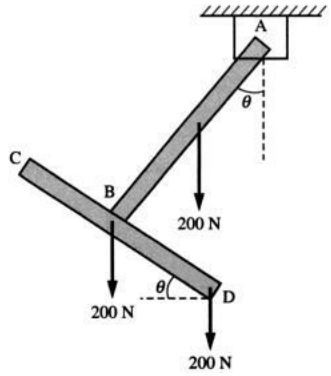
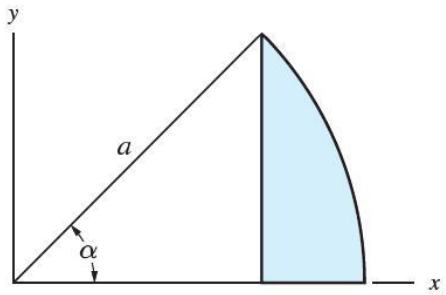
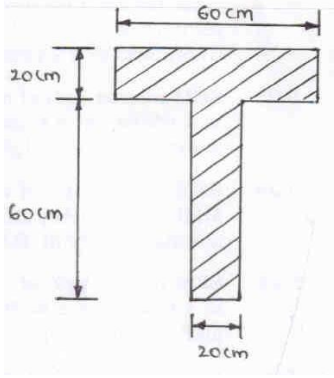
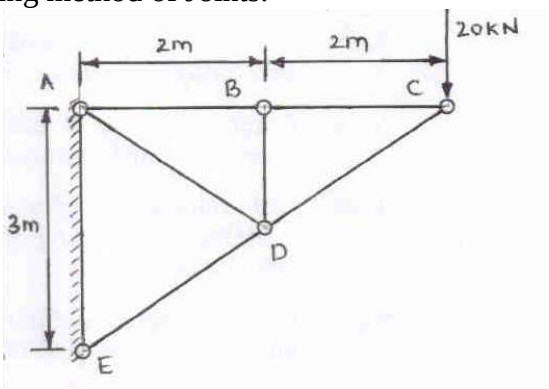
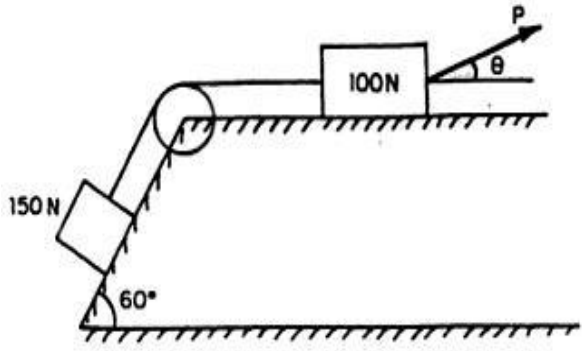
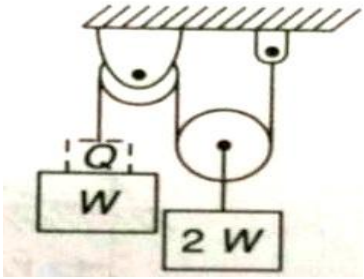
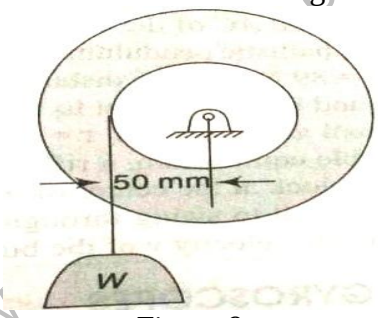
			CO	KL	M
		UNIT-I			
1.	a).	State and prove Varignon's theorem.	1	K2	8
	b).	Two cylinders of diameter 100 mm and 50 mm, weighing 200 N and 50 N, respectively are placed in a trough as shown in Figure 1. Assuming smooth surfaces, find the reactions at the points of supports 1, 2, 3 and 4.  Figure 1	1	K3	7
		OR			
2.	a).	A string ABC of length *l* carries a small pulley C from which a Load W is suspended as shown in Figure 2. The string hangs between two vertical walls which are at a distance *d* apart. The end A is higher than the end B by height *h*. Find the position of equilibrium defined by the angle α. Assume *d*= *l*/2 and *h*=*l*/4.  Figure 2	1	K3	8
	b).	Two identical prismatic bars AB & CD each weighing 200 N are welded together to form a Tee and are suspended in a vertical plane as	1	K3	7

		shown in Figure 3. Calculate the values of the θ that the bar AB will make with the vertical when a vertical load of 200 N is applied at D.  Figure 3			
		UNIT-II			
3.	a).	Derive the centriod of a wire bend in the form of a sector of an arc by taking the radius as 'r' and angle of sector as 'θ'.	2	K3	8
	b).	Determine the centriod of the shaded segment for Figure 4 by taking a = 18 m and $\alpha = 45^0$.  Figure 4	2	K3	7
		OR			
4.	a).	Derive the moment of inertia of triangle abt its centriodal axis and also deduce the same abt its base.	2	K3	8
	b).	Determine the moment of Inertia of the T-section shown in Figure 5 abt its centroidal axis.  Figure 5	2	K3	7

		UNIT-III			
5.	a).	Find t the forces in all the members of a pin jointed truss as shown in Figure 6 by using method of Joints.  Figure 6	3	K3	8
	b).	A uniform ladder 5m long on a horizontal grnd and leans against a smooth vertical wall at an angle of 70^0 with the horizontal. The weight of the ladder is 90 N and acts at its middle. The ladder is at the point of sliding, when a man weighing 75N stands on a rung 3.5m from the top of the ladder. Calculate the co-efficient of the friction between the ladder and the floor.	4	K3	7
		OR			
6.	a).	Explain the terms angle of repose, cone of friction and write the laws of friction	4	K1	8
	b).	Referring to the Figure 7 given above, determine the least values of the force P to cause motion to impend right wards. Assume the coefficient of friction under the blocks to be 0.2 and pulley to be frictionless.  Figure 7	4	K3	7
		UNIT-IV			
7.	a).	A stone is dropped from the top of a tower 60 m high. At the same instant, another stone is thrown vertically upwards from the foot of tower to meet the first stone at a height of 18 m. Determine (i) the time when the two stones meet; (ii) the velocity with which the second stone was thrown up.	5	K2	8
	b).	Weight W and 2W are supported in a vertical plane by a string and pulleys arranged as shown in Figure 8. Find the magnitude of an	5	K3	7

		additional weight Q applied on the left which will give a downward acceleration a = 0.1g to the weight W.  Figure 8			
		OR			
8.	a).	Define Time of Flight, Range and Maximum Height of a projectile.	5	K1	8
	b).	Derive the general equation of projectile motion.	5	K2	7
		UNIT-V			
9.	a).	A flywheel is rotating at 150 R.P.M. and after 8 seconds it is rotating at 120 R.P.M. If the retardation is uniform, determine number of revolutions made by the flywheel and the time taken by the flywheel before it comes to rest from the speed of 150 R.P.M.	6	K3	8
	b).	A rotor of weight W = 1720 N and radius of gyration k = 100 mm is mnted on a horizontal shaft and set in rotation by a falling we ight W = 1720 N as shown in Figure 9. If the system is released from rest, find the velocity of the block after it has fallen thrgh a distance of 3 m.  Figure 9	6	K3	7
		OR			
10.	a).	A body is rotating with an angular velocity of 8 radian/s. After 5 seconds, the angular velocity of the body becomes 28 radian/s. determine the angular acceleration of the body.	6	K3	8
	b).	Three bodies, a sphere, a cylinder and a hoop each having the same mass and radius are released from rest from an inclined plane of angle θ. Determine the velocity of each of the bodies after it has rolled down the incline plane thrgh a distance s.	6	K3	7