Regulation *R18* *Subject code: 2E2AD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech II Semester Supplementary Examinations, January 2024

Engineering Mechanics

(Common to CE & ME)

Maximum Marks: 70 Date:29.01.2024 Duration: 3 hours

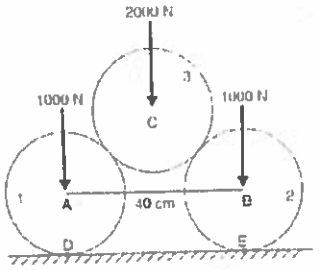
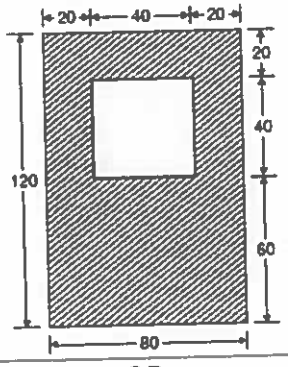
Note:
1. **This question paper contains two parts A and B.**
2. **Part A is compulsory which carries 20 marks. Answer all questions in Part A.**
3. **Part B consists of 5 Units. Answer any one full question from each unit.**
4. **Each question carries 10 marks and may have a, b, c, d as sub questions.**

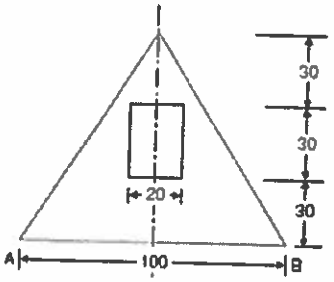
Part-A

All the following questions carry equal marks. (10x2M = 20 Marks)		CO	Bloom Tx
1.	What is Free Body Diagram?	1	L1
2.	Define the term "Friction".	2	L1
3.	Define Centre of gravity.	2	L1
4.	State the numerical formula of Young's modules.	3	L2
5.	State the theorem of Varignon's.	3	L1
6.	State the Numerical formula of Polar Moment of Inertia.	3	L2
7.	Explain the transfer formula for mass moment of inertia.	4	L2
8.	Find the product of inertia of a rectangle of sides a and b with respect to the axes that lie along its two sides.	4	L3
9.	State the D' Alembert principle.	4	L2
10.	Derive the Work energy equation for Translation motion.	5	L1

Part-B

Answer All the following questions. (5X10M = 50 Marks)			
11.(a)	A force F = (10 i + 8 j – 5 k) N acts at point A (2, 5, 6) m. What is the moment of the force about the point B (3, 1, 4). [5M]	1	L4
(b)	The forces P, Q, R and S act on a particle at O in the plane of the coordinate axis OX and OY making an angles p, q, r, s respectively with OX in the anti-clockwise direction. Determine the resultant and the angle it makes with OX when P = 3 KN, Q = 3 KN, R = 5 KN, S = 5 KN and p = 10°, q = 70°, r = 100°, s = 300° respectively. [5M]	1	L4
	OR		

12.	Two smooth circular cylinders, each of weight W = 1000 N and radius 15 cm, are connected at their centers by a string AB of length = 40 cm and rest upon a horizontal plane, supporting above them a third cylinder of weight = 2000 N and radius 15 cm as shown in the following figure. Find the force S in the string AB and the pressure produced on the floor at the points of contact D and E. [10M] 	1	L4
13.	A body weighing 20N is projected up a 200 inclined plane with a velocity of 12 m/s, coefficient of friction is 0.15. Find: [10M] i) The maximum distance S that the body will move up the inclined plane. ii) Velocity of the body when it returns to its original position.	2	L4
	OR		
14.	A train weighing 400000 KN is running up an inclined plane 1 in 100 at uniform speed of 54 kmph. If the total resistance to motion is 0.5% of its weight, find the power exerted by the steam engine. If the steam is cut-off while the train is ascending the gradient, how far the train will go up the plane, before coming to rest, assuming the frictional resistance to remain constant during the travel. [10M]	3	L4
15.	For the shaded area as shown in the following figure, determine the Moment of Inertia of an area of plane figure about their centroidal axes. All units are in centimeters. [10M] 	3	L4
	OR		

16.	Determine the moment of inertia an area of a triangle with a rectangular cut as shown in the following figure, about the base *A-B* and the centroidal axis parallel to *AB*. (All dimensions are in Centimeters). [10M] 	3	L4
17.(a)	Explain the terms 'Product of Inertia' and 'Principal axes. [5M]	3	L2
(b)	State and prove Pappu's theorems of area and volume. [5M]	3	L1
	OR		
18.(a)	State parallel axis theorem as applied to mass moment of inertia. [5M]	4	L1
(b)	Explain transfer formula for product of inertia. [5M]	4	L1
19.(a)	Differentiate Simple and Compound Pendulums. [5M]	5	L2
(b)	Define Impulse and Momentum, and derive their expressions from the differential equation of rectilinear motion of a particle. [5M]	5	L1
	OR		
20.(a)	State the law of conservation of momentum. [5M]	5	L1
(b)	Find the work done in drawing a body weighing 1000 N through a distance 10 m along a horizontal surface by a horizontal force of 400 N. [5M]	5	L1