R22 Regulation *Subject code:4E1AD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Semester Supplementary Examinations, July 2025

ENGINEERING MECHANICS

(CE)

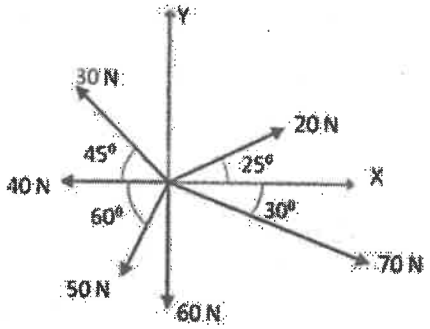
Maximum Marks: 60 Date: 14.07.2025 Duration: 3 hours

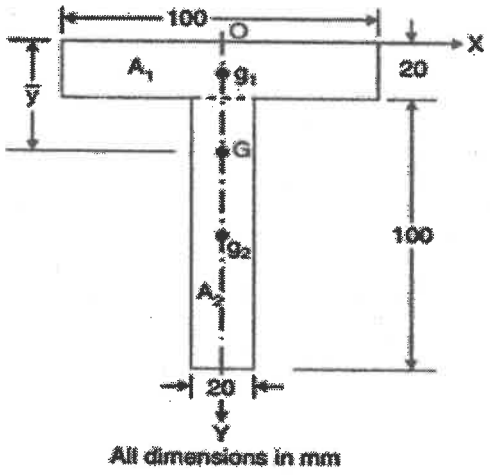
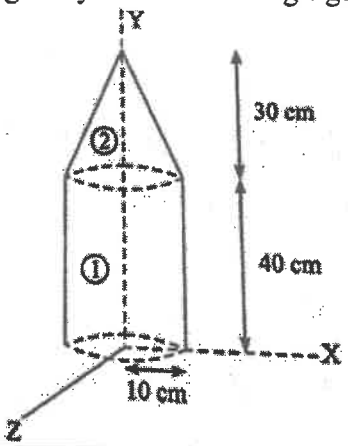
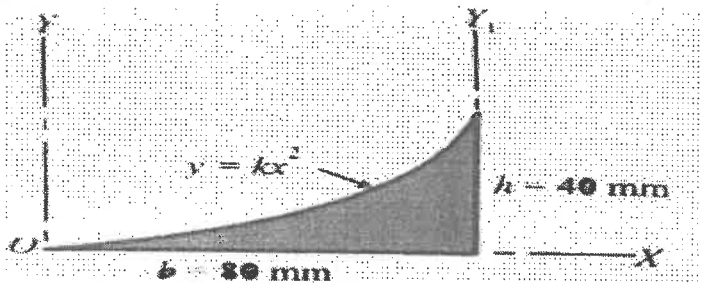
Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1 a	State Lami's theorem.	1M	1	L1
b	Write about coplanar force system.	1M	1	L1
c	Distinguish between centre of gravity and centroid.	1M	2	L1
d	What does the second theorem of pappus indicate?	1M	2	L1
e	What is polar moment of inertia?	1M	3	L1
f	Determine the Area moment of Inertia of a rectangle with respect to its centroidal X-axis parallel to the base.	1M	3	L1
g	Define rectilinear and curvilinear motions.	1M	4	L1
h	Write the equation of Dalembert principle.	1M	4	L1
i	What are the types of vibrations?	1M	5	L1
j	Define the term 'amplitude' with respect to a simple harmonic motion.	1M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	Find the resultant of the system of forces shown below. 	10M	1	L2
	OR			
3	Three concurrent forces *P*, *T* and *F* having a resultant of 10 N directed forward and up to the right at $\theta x = 60^0$, $\theta y = 60^0$ and $\theta z = 45^0$. P equal 21 N and passes from the origin through point (3, 2, 6). The value of T is 18 N and is directed from the origin toward point (-6, 6, -3). Determine the magnitude of the third force F and the angles it makes with the reference axes.	10M	1	L2

4	Locate the centroid of the T-section as show in figure.  	10M	2	L2
	OR			
5	Determine the centre of gravity of the following figure.  	10M	2	L2
6	Find the moment of inertia about Y axis of the shaded area under the second degree curve as shown in Figure.  	10M	3	L2
	OR			
7	Derive the mass moment of inertia of a cone about its base having radius 'r' and height 'h'.	10M	3	L2

8	Define work energy principle. Also derive the equation for work energy.	10M	4	L2
	OR			
9	An engine of mass 50 tonnes pulls a train of mass of 250 tonnes up a gradient of 1 in 125 with a uniform speed of 36 kmph. Find the power transmitted by the engine, if the tractive resistance is 60 Newton per tonnes. Also find the power transmitted by the engine, if the acceleration of the engine is 0.2 m/s^2 up the gradient.	10M	4	L2
10	a) A body moving with simple harmonic motion has amplitude of 1 m and a period of oscillation of 2 seconds. What will be its velocity and acceleration 0.4 seconds after passing an extreme position? b) Show that when a particle moves with simple harmonic motion, it's time for complete oscillation is independent of the amplitude of its motion.	6M 4M	5	L2
	OR			
11	What is the theory of virtual work, and what are its applications?	10M	5	L2