Course Code: 23CE2T01

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

I - B. Tech II-Semester Regular/Supplementary Examinations (BR23), June – 2025

ENGINEERING MECHANICS (CIVIL)

Time: 3 hours | Max. Marks: 70

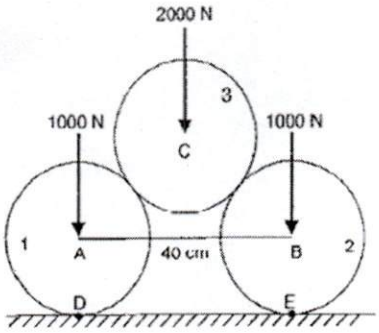
Question Paper consists of Part-A and Part-B
*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Define the moment of a force	(2M)	CO1	B1
b)	Define friction and write any two types.	(2M)	CO1	B1
c)	What is Lami's Theorem?	(2M)	CO2	B1
d)	What is the principle of virtual work	(2M)	CO2	B2
e)	Define centroid and center of gravity	(2M)	CO3	B1
f)	Write the expression for the moment of inertia of a rectangle about its base	(2M)	CO3	B1
g)	Distinguish between kinematics and kinetics.	(2M)	CO4	B2
h)	What is D'Alembert's principle?	(2M)	CO4	B2
i)	Define impulse and give its SI unit.	(2M)	CO5	B1
j)	Write the work-energy principle	(2M)	CO5	B1

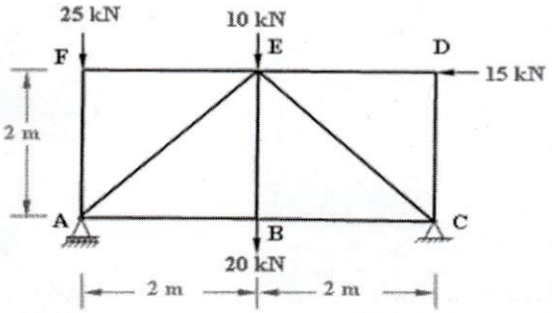
PART–B (5X10 = 50M)

2.a)	The following forces act at a point: (i) 30N inclined at 32^0 towards North of East. (ii) 15N towards North (iii) 20N towards North West and (iv) 45N inclined at 45^0 towards South of west. Find the magnitude and direction of the resultant force.	10(M)	CO1	B3
	(OR)			
	A uniform ladder of weight 800N and of length 7 m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with the horizontal is 600. When a man of weight 600N stands on the ladder at a distance 4m from the top of the ladder, the ladder is at the point of sliding. Determine the coefficient of friction between the ladder and the floor.	10(M)	CO1	B4
4.a)	Two smooth circular cylinders, each of weight W= 1000N and radius 15cm, connected at their centres by a string AB of length 40 cm and rest upon a horizontal plane supporting above them a third cylinder of weight 2000N and radius 15cm as shown in fig. below. Find the force in string AB and the pressure produced on the floor at the points of contact D and E.	10(M)	CO2	B4



(OR)

5.a)	Use the method of joints to determine the forces in all the members of pin-jointed plane truss as shown in the figure.	10(M)	CO2	B4



6.	Determine the centroid of a composite area made of a rectangle of dimensions 120 mm × 100 mm with a semicircular notch of 60 mm radius removed from the bottom edge.	10(M)	CO3	B3

(OR)

7.	Find the moment of inertia of an I-section (flanges: 200 mm × 20 mm; web: 160 mm × 20 mm) about its horizontal centroidal axis.	10(M)	CO3	B3
8.	The velocity of a particle moving in a straight line is given by the expression $v = t^3 - 2t^2 + 3t - 1$. The particle is found to be at a distance of 6 m from the station A after 1 seconds. Determine acceleration and displacement after 3 seconds; and maximum/minimum acceleration.	10(M)	CO4	B4

(OR)

9.	A block of mass 20 kg slides down a 30° inclined plane with a coefficient of friction 0.2. Using the work-energy principle, find its velocity after moving 5 m.	10(M)	CO4	B3
10.	The rotation of a flywheel is governed by the equation $\omega = 2t^2 + 4t + 1$ where w is in radians per second and t is in seconds. The angular displacement of the disc is known to be 6 radians at 2 seconds. Determine the angular displacement, angular velocity and angular acceleration of the flywheel when t = 4 seconds.	10(M)	CO5	B3

(OR)

11.	A flywheel weighing 30 kN and having a radius of gyration of 0.8 m is initially rotating at 360 rpm. It uniformly slows down to 240 rpm in 90 seconds. Determine the retarding torque acting on the flywheel, the change in its kinetic energy, and the change in its angular momentum during this time	10(M)	CO5	B4

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