Reg. No. | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.

(For those admitted in June 2021 and later)

PROGRAMME AND BRANCH: B.Sc., MATHEMATICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
VI	PART-III	CORE	U21MA614	DYNAMICS

Date & Session:26.04.2025/FN **Time : 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	SECTION – A (10 X 1 = 10 Marks) Answer ALL Questions.
CO1	K1	1.	What is the range on the horizontal plane through the point of projection a) $\frac{u \sin 2\alpha}{g}$ b) $\frac{u^2 sin2\alpha}{g}$ c) $\frac{u \cos 2\alpha}{g}$ d) $\frac{u^2 \cos 2\alpha}{g}$
CO1	K2	2.	Write the formula for the time taken to reach the greatest height a) $\frac{u \sin 2\alpha}{g}$ b) $\frac{u \cos 2\alpha}{g}$ c) $\frac{u \sin\alpha}{g}$ d) $\frac{u \sin 2\alpha}{g}$
CO2	K1	3.	What is the value of 'e' for perfectly elastic bodies? a) 0 b) 1 c) 2 d) -1
CO2	K2	4.	Which of the following is Newton's Experimental Law. a) $(v_1-v_2)/(u_1-u_2)= -e^2$ b) $(v_2-v_1)/(u_2-u_1)= e$ c) $v_1-v_2)/(u_1-u_2)= e^2$ d) $(v_2-v_1)/(u_2-u_1)= -e$
CO3	K1	5.	Differential equation of Simple Harmonic motion is_______________. a) $\frac{d^2x}{dt^2}+\mu x=0$ b) $\frac{dy}{dx}+\mu x=0$ c) $\frac{d^2x}{dt^2}+\mu x=1$ d) $\frac{d^2x}{dt^2} - \mu x=0$
CO3	K2	6.	Write the periodic time of simple harmonic equation. a) Π/μ b) $\frac{2\pi}{\sqrt{\mu}}$ c) $2 \Pi+\mu$ d) $\pi/\sqrt{\mu}$
CO4	K1	7.	What is the polar equation of equiangular spiral? a) $r= a/e^{\theta \cot\alpha}$ b) $r=e^{\theta \cot\alpha}$ c) $r= ae^{\sin\alpha}$ d) $r=ae^{\theta\cot\alpha}$

CO4	K2	8.	$r\dot{\theta}$ is which of the following? a) radial component of velocity b) transverse component of acceleration c) transverse component of velocity d) radial component of acceleration
CO5	K1	9.	Identify the pedal equation of central orbit. $a)\frac{h^2}{p^2}\frac{dp}{dx} = p$ $b)\frac{h}{p}\frac{dp}{dx} = p$ $c)\frac{h^2}{p^2}\frac{dp}{dr} = p$ $d)\frac{h^2}{p^2}\frac{dp}{dr} = -p$
CO5	K2	10.	Write the differential equation of a central orbit in polar coordinates a) $u - \frac{d^2u}{d\theta^2} = \frac{p}{h^2u^2}$ b) $u^2 - \frac{d^2u}{d\theta^2} = \frac{p}{h^2u^2}$ c) $u^2 + \frac{d^2u}{d\theta^2} = \frac{p}{h^2u^2}$ d) $u + \frac{d^2u}{d\theta^2} = \frac{p}{h^2u^2}$
Course Outcome	**Bloom's K-level**	**Q. No.**	**SECTION – B (5 X 5 = 25 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	11a.	If the greatest height attained by the particle is a quarter of its range on the horizontal plane through the point of projection, find the angle of projection. **(OR)**
CO1	K3	11b.	Determine the range on an inclined plane.
CO2	K3	12a.	Caculate the velocities of two smooth spheres after the direct impact. **(OR)**
CO2	K3	12b.	A ball of mass 8 gm. movng with a velocity of 10 cm. per sec. impinges directly on another of mass 24 gm. , moving at 2 cm. Per sec. In the same direction. If e=1/2, find the velocities after impact.Also estimate the loss in K.E.
CO3	K4	13a.	If the displacement of a moving point at any time be given by an equation of the form $x=a\cos \omega t+b\sin \omega t$, show that the motion is a simple harmonic motion.If $a=3,b=4,\omega = 2$ determine the amplitude. **(OR)**
CO3	K4	13b.	A particle is moving with S.H.M and while making an oscillation from one extreme position to the other, its distances from the center of oscillation at 3 consecutive seconds are x_1,x_2,x_3. Prove that the period

			of oscillation is $\dfrac{2\pi}{\cos^{-1}(\frac{x_1+x_3}{2x_2})}$
CO4	K4	14a.	Derive the polar equation of equiangular spiral.
			(OR)
CO4	K4	14b.	The velocities of a particle along perpendicular to a radius vector from a fixed origin are λr^2 and $\mu\theta^2$, where μ and λ are constants. Show that the equation to the path of the particle is $\frac{\lambda}{\theta}+C=\frac{\mu}{2r^2}$,where C is a constant.
CO5	K5	15a.	Derive the pedal equation of the central orbit.
			(OR)
CO5	K5	15b.	Determine the formula for perpendicular from the pole on the tangent.

Course Outcome	Bloom's K-level	Q. No.	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	16a.	Show that the path of a projectile is a parabola.
			(OR)
CO1	K3	16b.	A particle is thrown over a triangle from one end of a horizontal base and grazing the vertex falls on the other end of the base. If A, B are the base angles and α ,the angle of projection, show that tan α =tan A+tan B.
CO2	K4	17a.	Determine the loss of K.E due to direct impact of two smooth spheres.
			(OR)
CO2	K4	17b.	Determine the loss of K.E due to oblique impact of two smooth spheres.
CO3	K4	18a.	Determine the resultant displacement of the composition of two simple harmonic motions of the same period and in the same straight line.
			(OR)
CO3	K4	18b.	Determine the resultant displacement of the composition of two simple harmonic motions of the same period and in two perpendicular directions.
CO4	K5	19a.	Show that the path of a point p which possesses two constant velocities u and v ,the first of which is in a fixed direction and the second of which is perpendicular to the radius OP drawn from a fixed point O, is a conic whose focus is O and whose eccentricity is u/v.
			(OR)
CO4	K5	19b.	A point p describes a curve with constant velocity and its angular velocity about a given fixed point o varies inversely as the distance from o.show that the curve is an equiangular spiral whose pole is o and that the acceleration of the point is along the normal at p. and varies inversly as OP.

CO5	K5	20a.	A particle moves in a plane with an acceleration which is always directed to a fixed point O in the plane. Obtain the differential equation of its path. **(OR)**
CO5	K5	20b.	Prove that in every central orbit the areal velocity is constant and the linear velocity varies inversely as the perpendicular from the center upon the tangent to the path.