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

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

PG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.

(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: M.Sc., MATHEMATICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
IV	PART-III	CORE-12	P23MA412	MECHANICS

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 meant by the term "constraint" in the context of particle motion? a) A force applied to a system b) A limitation on the motion of a system c) The speed of the particle d) The acceleration of the system
CO1	K2	2.	Write the type of constraint for the following system:A bead is sliding along a rigid, curved wire that is fixed in space. a) scleronomous constraints b) Rheonomus constraints c) holonomic constraints d) non holonomic constraints
CO2	K1	3.	The work done by the forces of the system during the virtual displacement is named as Virtual a) accelartion b) velocity c) momentum d) work done
CO2	K2	4.	Write the condition for the virtual work done by the applied forces in a system that is in equilibrium. a) Zero b) One c) Two d) Three
CO3	K1	5.	The shortest distance between two points on a given surface are named as the _____of the surface. a) Geodesics b) virtual c) holonomic d) non holonomic
CO3	K2	6.	Write the correct condition under which the generalized momentum conjugate to a cyclic coordinate is conserved. a) The coordinate appears explicitly in the Lagrangian. b) The Lagrangian does not depend on the velocity associated with the coordinate c) The coordinate does not explicitly appear in the Lagrangian. d) The coordinate depends on time explicitly.
CO4	K1	7.	For two body central force problem find the equation of motion a) T+V is constant b) T+V=0 c) T+v= 1 d) T+v= -1
CO4	K2	8.	Write In the two-body central force problem, the relative motion can be reduced to: a) A three-body problem b) A one-body problem with reduced mass c) A two-body problem with increased mass d) A linear motion problem
CO5	K1	9.	Identify , the conservation of angular momentum the Arial velocity is a) unity b) constant c) identity d) null
CO5	K2	10.	Identify if the gravitational force is inversely proportional to the square of the distance between two bodies. a) newton's law b) Hook's law law c) power law d) inverse square law

Course Outcome	Bloom's K-level	Q. No.	**SECTION – B (5 X 5 = 25 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K2	11a.	Show that the moment of force is the rate of change of angular momentum. **(OR)** Explain the expression for kinetic energy of the system of particles.
CO1	K2	11b.	
CO2	K2	12a.	Explain the principle of virtual work done. **(OR)**
CO2	K2	12b.	Determine the equation of motion of a bead sliding on a uniformly rotating wire in a force free space.
CO3	K3	13a.	Show that the surface of revolution obtained by revolving a curve between two fixed points about the x axis is minimum if the curve is a centenary . **(OR)**
CO3	K3	13b.	Find the shortest distance between two points in a plane as well as in space is a straight line.
CO4	K3	14a.	For two body central force problem how to find the equation of motion. **(OR)**
CO4	K3	14b.	Find the magnitude and direction of the velocity of the central orbit.
CO5	K4	15a.	Explain the motion in time in the Kepler problem. **(OR)**
CO5	K4	15b.	Derive $\tan\frac{\theta}{2} = \sqrt{\frac{1+e}{1-e}}tan\frac{\psi}{2}$

Course Outcome	Bloom's K-level	Q. No	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K4	16a.	Prove that work done is equal to the change in the kinetic energy. **(OR)**
CO1	K4	16b.	Illustrate the Conservation Theorem for total angular momentum.
CO2	K5	17a.	Prove that the Lagranges equation of motion for a holonomic conservative system. **(OR)**
CO2	K5	17b.	Evaluate the Lagrange's equation of motion for Atwood's machine.
CO3	K5	18a.	Prove that the Lagranges equation of motion for a non holonomic system. **(OR)**
CO3	K5	18b.	Prove that the paths followed by a particle in sliding from one point to another in the absence of friction, in the shortest time in a cycloid.
CO4	K5	19a.	Prove that the central orbit is symmetrical about the apsidal vectors. **(OR)**
CO4	K5	19b.	Prove that the central force motion of the two bodies about the center of mass Can always be reduced to an equivalent one body problem.
CO5	K6	20a.	Prove that the inverse square law of force. **(OR)**
CO5	K6	20b.	Prove that the square of the period is propositional to the cube of the mean distance from the sun.