

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION MAY 2024
(Second Semester)

Branch – **PHYSICS**
CLASSICAL MECHANICS

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	The Lagrangian L of a system with the kinetic energy T and the potential energy V is a) $L=T+V$ b) $L= T-V$ c) $L= T-2V$ d) $L= 2(T-V)$	K1	CO1
	2	Constraint in a rigid body is a) Holonomic b) non-holonomic c) scleronomous d) none of these	K2	CO1
2	3	Hamiltonian is the function of a) Generalised coordinates and generalised velocities b) Generalised coordinates and generalised momenta c) Generalised velocities and generalised momenta d) Constants	K1	CO2
	4	For a conservative system the Hamiltonian is a) $H = T+V$ b) $H= T-V$ c) $H=2T+V$ d) $H=T+2V$	K2	CO2
3	5	The dimension of generalised momentum a) Are always those of linear momentum b) Are always those of angular momentum c) May be those of linear momentum d) May be those of angular momentum	K1	CO3
	6	If e is the eccentricity of the earth's orbit, the ratio of maximum and minimum speeds of the planet is a) $(1+e) / (1-e)$ b) $(1-e) / (1+e)$ c) $(1+e) * (1-e)$ d) 0	K2	CO3
4	7	In pendulum motion, the integral of motion is a) Velocity b) Amplitude c) linear momentum d) Energy	K1	CO4
	8	The kinetic energy of a rigid body is a) $1/2 \omega \cdot J$ b) $1/2 \omega \cdot p$ c) $1/2 \omega \times J$ d) $1/2 \omega \times p$	K2	CO4
5	9	Hamilton Jacobi equation is a) $\partial S/\partial t+H(q, \partial P/\partial q,t)=0$ b) $\partial S/\partial t+H(q, \partial S/\partial q,t)=0$ c) $\partial S/\partial t+S(q, \partial S/\partial q,t)=0$ d) $\partial S/\partial t+S(q, \partial H/\partial q,t)=0$	K1	CO5
	10	The Poisson bracket of $[q_k, q_l]$ is equal to a) Zero b) $[p_k, p_l]$ c) $[q_k, p_l]$ d) All of the above	K2	CO5

Cont...

SECTION - B (35 Marks)Answer **ALL** questions**ALL** questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Deduce the principle of virtual work.	K5	CO5
	(OR)			
	11.b.	Determine the equation of simple pendulum by Lagrangian method.		
2	12.a.	Analyze the particle moving on the earth surface.	K4	CO4
	(OR)			
	12.b.	Using variational principle to examine the bead sliding on a uniformly rotating wire in a force free space.		
3	13.a.	Determine the motion under the inverse square law of Kepler's problem.	K5	CO5
	(OR)			
	13.b.	Derive inverse square law of force.		
4	14.a.	Discuss Coriolis force.	K6	CO3
	(OR)			
	14.b.	Discuss about Sleeping top conditions under gravity.		
5	15.a.	Deduce Hamilton -Jacobi equation for Hamilton's principle.	K5	CO5
	(OR)			
	15.b.	Determine the relation between the component of p and j.		

SECTION -C (30 Marks)Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Obtain Lagrange's equation for non conservative system.	K5	CO1
2	17	Obtain the equation of motion of isotropic oscillator.	K5	CO2
3	18	Deduce the transformation of scattering problem to laboratory coordinates.	K4	CO3
4	19	Deduce Euler's integral.	K3	CO4
5	20	Derive canonical transformation equation.	K5	CO5