Reg. No ..... Name **22P1020**

M. Sc. DEGREE END SEMESTER EXAMINATION : OCTOBER 2022

SEMESTER 1 : PHYSICS

COURSE : **21P1PHYT02: CLASSICAL MECHANICS**

(For Regular - 2022 Admission and Supplementary - 2021 Admission)

Duration : Three Hours Max. Weights: 30

PART A

Answer any 8 questions **Weight: 1**

1.	Explain the physical significance of Euler-Lagrange's equations.	(U)
2.	Generalised co-ordinates need not have dimensions of length . Likewise components of generalised force do not neccesarily have the dimensions of force. Justify your answer.	(U)
3.	What are rheonomic constraints? Give an example.	(U)
4.	Show that the generalised momentum conjugate to a cyclic co-ordinate is conserved.	(E)
5.	What is Poisson's theorem?	(U)
6.	Sketch the normal modes of vibration of a CO_2 molecule in the increasing order of frequency.	(A)
7.	Prove that the Poisson bracket [F,G+S] = [F,G]+[F,S].	(A)
8.	What are Euler angles?	(U)
9.	Write the Hamilton - Jacobi equation and mention the terms.	(R)
10.	Write Lorentz transformation in matrix form.	(U)

(1 x 8 = 8)

PART B

Answer any 6 questions **Weights: 2**

11.	A cyclinder of radius 'a' and mass 'm' rolls down an inclined plane making an angle 'θ' with the horizontal. Set up the Lagrangian and find the equtaion of motion.	(A)
12.	Discuss isotropy of space and conservation of angular momentum	(An)
13.	The fundamental Poisson bracket provide the most convenient way to decide whether a given transformation is canonical. Discuss.	(An)
14.	Show that the transformation $Q = \frac{1}{p}$ and $P = qp^2$, is canonical.	(A)
15.	Show that infinitesimal rotations commute.	()
16.	What are the two conserved quantities in torque free motion of a rigid body?	(A)
17.	Use action-angle variables to obtain the energy levels of the hydrogen atom	(A)
18.	Briefly explain Thomas preession rotation and Thomas precession frequency.	(A)

(2 x 6 = 12)

PART C

Answer any 2 questions **Weights: 5**

19. What is Hamiltonian function.Explain its physical significance. Prove that the Hamiltonian of a conservative system is equal to the total energy of the system. (An)

20. What are Poisson brackets? Prove that for any function F, G and K of 'q' and 'p', the following relation holds true. (A)
$[F,[G,K]]+[G,[K,F]]+[K,[F,G]]=0.$

21. A particle moves in a circular orbit of diameter 'b' in central force field. If the centre of attraction is on the circumference itself, find the law of force. ()

22. Discuss seperation of variables in the H-J equation. (An)

(5 x 2 = 10)

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;