

Reg. No.:



Name:

University of Kerala

Y7972

Fourth Semester FYUGP Degree Examination, May 2026

Discipline Specific Core Course

PHYSICS

UK4DSCPHY200 - Classical Dynamics

Academic Level: 200-299

2024 Admission

Time: 1 Hour 30 Minutes(90 Mins.)

Max. Marks: 42

**Part A. 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark
Each.Answer all questions**

Qn No.	Question	CL	CO
1	State Einstein's mass-energy relation.	RE	4
2	Define constraints in mechanics.	RE	1
3	Identify one example of the two-body problem	UN	3
4	Outline the condition for the Hamiltonian be equal to total energy.	UN	2
5	Write down the cyclic coordinates that corresponds to the Lagrangian of a projectile, $L = \frac{1}{2}m(\dot{x}^2 + \dot{y}^2 + \dot{z}^2) - mgz$.	UN	2
6	Explain the physical significance of Hamiltonian.	UN	2

Part B. 8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	Explain Galilean transformations.	UN	4
8	Describe the formalism of Hamiltonian equations of a 1-Dimensional harmonic oscillator.	UN	2
9	Illustrate the expression for virtual displacement in the principle of virtual work	AP	1
10	Apply the following Lagrangian to find the generalized momenta of the system, $L = \frac{1}{2} m(\dot{r}^2 + r^2\dot{\theta}^2) + GMm/r$.	AP	2

Part C. 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer.7 marks each.Answer all 4 Questions choosing among options * within each question

Qn No.	Question	CL	CO
11	A) Apply the equations of motion under a central force (integral of motion) and establish the conservation of energy OR B) Solve the differential equation of orbit in central force motion.	AP	3, 3
12	A) Analyze why length contraction occurs only along the direction of motion. OR B) Analyze the twin paradox and explain why the travelling twin ages less.	AN	4, 4
13	A) Evaluate the importance of Einstein's postulates in modern physics. OR B) Evaluate the significance of the Michelson Morley experiment.	EV	4, 4
14	A) Define constraints in particle mechanics. Classify holonomic and non-holonomic constraints with examples, and show how they reduce degrees of freedom. OR B) Analyze Atwood's machine using Lagrangian mechanics: Define generalized coordinate, compute T and V, derive acceleration, and compare with Newtonian result.	CR	1, 1