

Reg No:.....
Name :.....

K24FY 1482 (B)

First Semester FYUGP Physics Examination
NOVEMBER 2024 (2024 Admission onwards)
KU1DSCPHY112 (BASIC MECHANICS)
(DATE OF EXAM: 4-12-2024)

Time : 90 min

Maximum Marks : 50

Part A (Answer any 6 questions. Each carries 2 marks)

- 1. Define force and give its SI unit. 2
- 2. How is the net force on an object related to its acceleration? 2
- 3. List the four fundamental forces of nature. 2
- 4. Write the expression for centripetal force and explain its significance. 2
- 5. What is the difference between kinetic energy and potential energy Give one example each? 2
- 6. Explain how moment of inertia is computed for a solid disc. 2
- 7. Define a black hole in simple terms. 2
- 8. How does the gravitational force affect the motion of planets around the sun? 2

Part B (Answer any 4 questions. Each carries 6 marks)

- 9. Draw and analyze a free-body diagram of a block on an inclined plane, considering friction. Calculate the net force acting on the block and the acceleration of the block down the plane. 6
- 10. A cyclist goes around a circular track with a radius of 50 m at a constant speed of 12 m/s. Calculate the centripetal acceleration and the net force acting on the cyclist if their mass is 70 kg. 6
- 11. Based on a block sliding on a frictionless table highlight work energy theorem 6
- 12. Calculate the angular momentum of a 1.5 kg mass moving in a circular path of radius 2 m at a speed of 6 m/s. 6
- 13. Calculate the gravitational potential energy of a satellite in orbit around Earth. Discuss how this energy relates to its kinetic energy and orbital speed. 6
- 14. Using Kepler's Third Law, calculate the orbital period of a satellite that is 12,000 km from the center of the Earth. 6

Part C (Answer any 1 question(s). Each carries 14 marks)

- 15. (a) Explain the conservation of angular momentum of a skater performing a spin. Describe how the skater's moment of inertia changes as they pull in their arms and analyze its effect on rotational speed. 7
- (b) Apply the work-energy theorem to calculate the work done by a variable force acting on an object. How does this relate to the object's kinetic energy? 7
- 16. Apply the concepts of angular velocity and acceleration to analyze a spinning wheel. Calculate the angular momentum and kinetic energy of the wheel given its moment of inertia. 14