U7507

Reg. No.: .....

Name:.....

University of Kerala

First Semester Degree Examination, November 2024

Four Year Under Graduate Programme

Discipline Specific Core Course

PHYSICS

UK1DSCPHY100- Foundation Course in Physics I

Academic Level: 100-199

Time: 1½ hours Max.Marks: 42

Part A.

Answer All Questions, Objective Type. 1 Mark Each.

(Cognitive Level: Remember/Understand) 6 Marks. Time: 6Minutes

Qn.No.	Question	Cognitive Level	Course Outcome (CO)
1.	State Gauss' divergence theorem.	Remember	1
2.	State SI unit of power.	Remember	2
3.	Explain how gravity affects the weight of an object, but not the mass.	Understand	2
4.	Explain why the kinetic energy will always be positive or zero	Understand	3
5.	Discuss the method to calculate work from a force vs. distance graph.	Understand	3
6.	Discuss the equation for total kinetic energy in rolling motion.	Understand	4

Part B.

Answer All Questions, Short Answer. 2 Marks Each.

(Cognitive Level: Understand/Apply) 8 Marks. Time: 24 Minutes

Qn.No.	Question	Cognitive Level	Course Outcome (CO)
7.	Describe how acceleration due to gravity varies with location.	Understand	2
8.	Sketch the divergence of flux lines on electric charge (both positive and negative).	Apply	1
9.	Estimate the work done in a closed loop by a conservative force.	Apply	3
10.	Write a note on elastic potential energy	Understand	4

Part C.

Answer all 4 questions, choosing among options within each question.

Long Answer. 7 Marks Each.

(Cognitive Level: Apply) 28 Marks. Time: 60 Minutes

Qn.No.	Question	Cognitive Level	Course Outcome (CO)
11.	A. A spacecraft of mass 1000 kg is traveling in space and fires its thrusters to exert a constant force of 4000 N for 5 seconds. i) Calculate the acceleration of the spacecraft. ii) Determine the change in velocity of the spacecraft after 5 seconds. iii) Find the total distance traveled by the spacecraft during this time. **OR** B. A 10 kg object is subjected to a force of 40 N at an angle of 30° above the horizontal. The object moves horizontally on a frictionless surface. i) Calculate the horizontal component of the force. ii) Determine the vertical component of the force. iii) Find the acceleration of the object in the horizontal direction.	Apply	5
12.	A. Derive the impulse-momentum theorem using the statement of Newton's second law and explain how it relates to the change in momentum of an object. **OR** B. A baseball of mass 0.15 kg is thrown with a velocity of 40 m/s. The bat strikes the ball and reverses its direction, sending it back with a velocity of 30 m/s. The time of contact between the bat and the ball is 0.02 seconds. i) Calculate the change in momentum of the baseball. ii) Determine the impulse delivered by the bat to the ball. iii) Calculate the average force exerted by the bat on the baseball.	Apply	2
13.	A. Describe how work and energy are calculated for an object moving along a curved path under the influence of a variable force. **OR** B. i) Discuss elastic potential energy and calculate the expression for total elastic potential energy stored in a spring when it gets compressed. ii) A person weighing 600 N steps on a bathroom scale that contains a stiff spring. In equilibrium, the spring is compressed 1.0 cm under her weight. Find the force constant of the spring and total elastic potential energy. stored in it.	Apply	3
14.	A. State and explain parallel axes theorem. Apply this theorem to determine the moment of inertia of a thin wire with respect to an axis passing through its edge and parallel to its principal axis. **OR** B. A uniform rod of mass 4 kg and length 1.5 meters is pivoted at a point 0.3 meters from one of its ends. The axis of rotation is perpendicular to the rod. i) Calculate the moment of inertia of the rod about this axis using the parallel axis theorem. ii) If the rod is rotating with an angular speed of 6 rad/s, determine its rotational kinetic energy.	Apply	4