



U7508

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 Stoke's theorem.	Remember	1
2.	Recall the equation for power in rotational motion.	Remember	4
3.	Write two consequences of Newton's second law of motion.	Understand	2
4.	What are inertial frames of references?	Understand	2
5.	Discuss how work is calculated in rotational object.	Understand	4
6.	Describe, using an equation, how elastic potential energy is affected when a spring is compressed.	Understand	3

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.	Estimate whether the force $\vec{F} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$ is conservative or not.	Apply	1
8.	Summarize impulse - momentum theorem.	Understand	2
9.	Derive the moment of inertia of a solid disc of mass M and radius R rotating about its central axis.	Apply	3
10.	Explain how the moment of inertia affect the kinetic energy of a rotating object.	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 car of mass 1000 kg accelerates uniformly from rest to a speed of 20 m/s in 8 seconds. i) Calculate the acceleration of the car. ii) Determine the force exerted by the engine to produce this acceleration. iii) Find the distance travelled by the car during this time. OR B. A ball of mass 0.2 kg is moving at a velocity of 10 m/s. It is struck by a bat, and its velocity changes to 5 m/s in the opposite direction. The impact lasts for 0.02 seconds. i) Calculate the change in momentum of the ball. ii) Determine the impulse delivered by the bat to the ball. iii) Find the average force exerted by the bat on the ball during the impact.	Apply	5
12.	A. i) State Newton's second law to derive the relationship between force and mass. ii) Explain the difference between mass and weight. OR B. A cat is inside a lift, when the lift is moving up with certain acceleration, the apparent change in weight is 25%. When the lift moves down with double acceleration, what is the apparent change in weight?	Apply	2
13.	A. Explain the work-energy theorem and apply it to a situation where a moving object comes to a stop under the influence of friction. Discuss how the work done by friction is related to the change in the object's kinetic energy. OR B. A roller coaster of mass 300 kg starts from rest at the top of a 25 m high hill. As it descends, 5000 J of work is done against friction. i) Calculate the potential energy of the roller coaster at the top of the hill. ii) Using the law of conservation of energy, determine the speed of the roller coaster at the bottom of the hill, accounting for the work done by friction. iii) What would the speed of the roller coaster be at the bottom of the hill if there were no friction?	Apply	3
14.	A. Explain how kinetic energy in a system is distributed between rotational and translational motion for a rolling object. OR B. A solid disc of mass 8 kg and radius 0.9 m is rotating about an axis that passes a point 0.4 m from the center and is parallel to its central axis. i) Use the parallel axes theorem to calculate the moment of inertia of the disc about this axis. ii) If the disc rotates at 15 rad/s, calculate its rotational kinetic energy	Apply	4