Reg. No.: ……..

W7997

Name: ……...

University of Kerala
First Semester FYUGP Degree Examination, December 2025
Discipline Specific Core Course
PHYSICS
UK1DSCPHY103 INTRODUCTION TO MECHANICS AND ENERGY RESOURCES
Academic Level: 100-199
2024 Admission

Time: 1 Hour 30 Minutes **Max. Marks: 42**

Part A.
6 Marks. Time: 6 Minutes. (Cognitive Level: Remember/Understand)
Objective Type. 1 Mark Each. Answer All Questions

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
1.	Define the term physical quantity	Remember	1
2.	Recall the formula for gravitational force between two masses	Remember	2
3.	Explain the role of gravity in keeping a satellite in orbit	Understand	2
4.	Describe any one merit and one demerit of biomass energy as a renewable energy source	Understand	3
5.	Explain the Newton's second law of Rotation.	Understand	4
6.	Interpret the concept of rotational kinetic energy by providing its formula	Understand	4

Part B.
8 Marks. Time: 24 Minutes. (Cognitive Level: Understand/Apply) Short Answer. 2 Marks Each. Answer All Questions

Qn. No.	Question	Cognitive Level	Course Outcome (CO)
7.	Interpret by calculation the gravitational force between two objects of mass 10 Kg and 20 Kg separated by a distance of 10 m.	Understand	2
8.	Explain the working of solar water heater	Understand	3
9.	Determine a vector C such that C= A B, where $A = 5\hat{i} + 6\hat{j} + 2\hat{k}$ & $B = \hat{i} + \hat{j} + \hat{k}$	Apply	1
10.	The wheel of a car is rotating at the rate of 1200 revolutions per minute. On pressing the accelerator for 10 sec it starts rotating at 4500 revolutions per minute. Interpret by calculation the angular acceleration of the wheel.	Understand	4

Part C.

28 Marks. Time: 60 Minutes. (Cognitive Level: Apply/Analyse/Evaluate/Create)

Long Answer. 7 marks each. Answer all 4 Questions, choosing among options* within each question.

Qn. No.	Question	Cognitive Level	CO
11.	A. a. Illustrate about significant figures writing the rules for calculating significant figures. b. Calculate the number of significant figures for the following data a)7447 b)23.07 c)0.083 d)5600 e)10.30 f) $2.30x10^4$ OR B a. Illustrate dot product and cross product of two vectors. b. Determine the dot and cross product of vectors $\bar{a} = \hat{i}+2\hat{j}+3\hat{k}$ and $b=4\hat{i}+5\hat{j}+6\hat{k}$	Apply	1
12.	A. a. Explain the equation for gravitational potential energy, kinetic energy and total energy of a satellite in circular orbit. b. An astronaut releases a bowling ball of mass 7.20 Kg into circular orbit about earth at an altitude h of 350 Km. Interpret by calculation the mechanical energy E of the ball in its orbit. Radius of earth (R) = 6400 Km, Mass of earth = $6x10^{24}$ Kg OR B. Restate and explain Kepler's laws of planetary motion and identify which of the Kepler's law is equivalent to the law of conservation of angular momentum	Understand	2
13.	A. Discuss the current state of renewable energy technologies, including solar and wind, and their critical role in transitioning to a sustainable energy future, highlighting advancements, challenges, and potential impacts on global energy systems OR B. Summarize a detailed description of the basic functioning of a nuclear reactor, outlining the processes involved in nuclear fission and energy generation. Additionally, explain the safety mechanisms used in nuclear reactors to prevent accidents, including cooling systems, control rods, and containment structures.	Understand	3
14.	A. Discuss the relationship between linear and angular variables, explaining how linear displacement, velocity, and acceleration correspond to angular displacement, angular velocity, and angular acceleration for a point on a rotating object, and how these relationships are governed by the radius of the rotation. Interpret the angular velocity of a second hand of a watch OR B. a. Summarize the concept of rotational inertia (moment of inertia) to explain how it varies depending on the mass distribution of an object, highlighting its role in rotational motion and how different shapes and mass arrangements affect an object's resistance to changes in its angular velocity. b. Describe torque and explain how it causes rotational motion. c. Discuss the factors that affect the magnitude of torque and how torque differs from force.	Understand	4