



Reg. No.:

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

2025-Admission onwards

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	Relate the SI derived unit of Force, the Newton (N), entirely in terms of the fundamental SI base units (kilogram, meter, and second).	RE	1
2	Name two non-conventional energy sources	RE	3
3	Explain gravitational potential energy.	UN	2
4	Outline two merits of solar energy.	UN	3
5	Interpret angular velocity.	UN	4
6	Illustrate unit vectors.	UN	1

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	Compare geostationary and polar satellites.	UN	2
8	Interpret torque. Outline the SI unit of torque.	UN	4
9	A boat travels 6 km east and then 8 km north. Make use of vector methods to determine the magnitude of the displacement and the direction of the displacement measured.	AP	1
10	Utilise Einstein's mass-energy relation to explain how a small mass defect in nuclear fission can produce a large amount of energy.	AP	3

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	<p>A)</p> <p>Utilise the concept of moment of inertia to calculate the kinetic energy of a rotating rigid body.</p> <p>OR</p> <p>B)</p> <p>A wheel of radius 0.4 m rotates with an angular velocity of 15 rad/ s. The wheel is a solid disc of mass 4 kg. Calculate,</p> <p>(a) The linear speed of a point on the rim.</p> <p>(b) The moment of inertia of the solid disc.</p> <p>(c) If a constant angular acceleration of 3 rad/s² acts on the wheel, the torque producing this acceleration.</p> <p>(d) The rotational kinetic energy of the wheel when its angular speed is 15 rad/s</p>	AP	4, 4
12	<p>A)</p> <p>Analyze the challenges faced when integrating renewable energy sources like solar and wind into existing conventional power grids. Suggest solutions.</p> <p>OR</p> <p>B)</p> <p>Analyse the functioning of a nuclear reactor</p>	AN	3, 3
13	<p>A)</p> <p>Evaluate how well Kepler's laws explain the motion of artificial satellites around Earth.</p> <p>OR</p> <p>B)</p> <p>Deduct the expression for orbital velocity near Earth's surface.</p>	EV	2, 2
14	<p>A)</p> <p>Given two values with different precisions — 0.005600 m and 12.300m — create the sum and product using correct significant figures and discuss the reasoning behind your rounding choices</p> <p>OR</p> <p>B)</p> <p>You are designing the motion of a small robot on a flat table. You decide the robot will move according to the following two vectors:</p> $A = 4 \hat{i} + 3 \hat{j}$ $B = -1 \hat{i} + 5 \hat{j}$ <p>Using these vectors:</p>	CR	1, 1

Qn No.	Question	CL	CO
	i) Estimate the robot's resultant displacement. ii) Construct the dot product $A \cdot B$. iii) Formulate the magnitude of the cross product $A \times B$ assuming motion in the xy-plane.		

Model QP