UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DGE 1312
COURSE	: FUNDAMENTAL OF PHYSICS
SEMESTER/SESSION	: 2 - 2024/2025
DURATION	: 2 HOURS

Instructions:

1. This booklet contains FOUR (4) questions. Answer ALL questions.
2. All answers should be written in the answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 4 PRINTED PAGES INCLUDING THE COVER PAGE

INSTRUCTION: ANSWER ALL THE QUESTIONS

QUESTION 1

a) Define distance and displacement. (2 Marks)

b) Differentiate between scalar and vector quantities. Provide two (2) examples of each related to motion. (4 Marks)

c) A car travels 120 meters north in 6 seconds and then 80 meters south in 4 seconds. Determine the car's average velocity while traveling. (2 Marks)

d) An object is thrown vertically upward with an initial velocity of 30 m/s. Assuming acceleration due to gravity is 9.81 m/s^2, calculate:

i) The maximum height reached by the object. (2 Marks)

ii) The total time taken for the object to return to its original position. (2 Marks)

e) A cyclist accelerates uniformly from rest to a speed of 15 m/s over a distance of 200 meters.Calculatethe acceleration of the cyclist and thetime taken to reach this speed. (3 Marks)

QUESTION 2

a) Give three (3) examples of rotational motion. (3 Marks)

b) Explain the relationship between linear velocity and angular velocity. (3 Marks)

c) A wheel rotates with a constant angular acceleration of 2 rad/s^2. If its initial angular velocity is 3 rad/s, calculate:

i) The angular velocity after 4 seconds. (1 Mark)

ii) The total revolutions will the wheel go through during this time. (2 Marks)

d) An object completes 2 full revolutions in 19 seconds.

i) Calculate the angular velocity in radians per second. (2 Marks)

ii) If the diameter of the circular path is 160 cm, determine the linear velocity of the object. (2 Marks)

e) A disk starts from rest and accelerates uniformly at 4 rad/s^2 for a duration of 5 seconds.Determine the total revolution rotated by the disk during this period. (2 Marks)

QUESTION 3

a) StateFirst Newton's Law. (3 Marks)

b) Draw free body diagrams for the following scenarios: (3 Marks)

i) A box with a weight of 20 N is resting on a flat table. The box is not moving.

ii) A person weighing 600 N is sliding down a frictionless ramp inclined at an angle of 30 degrees to the horizontal.

iii) A sign is hanging from a ceiling by a rope. The sign has a weight of 10 N acting downward due to gravity.

c) A 10 kg box is pushed across a horizontal surface with a force of 50 N. If the frictional force opposing the motion is 20 N, calculate the acceleration of the box. (2 Marks)

d) Two masses, m_1 = 8 kg and m_2 = 3 kg are connected by a light inextensible string that passes over a frictionless pulley. The mass, m_1 is hanging on one side while m_2 is hanging on the other side. Assume the only forces acting on the objects are gravity and tension in the string. Determine:

i) The acceleration of the system. (5 Marks)

ii) The tension in the string. (2 Marks)

QUESTION 4

a) Define the following terms:

i) Work (2 Marks)

ii) Kinetic Energy (2 Marks)

iii) Potential Energy (2 Marks)

b) State the principles of conservation of energy. (3 Marks)

c) A motor lifts a 150 kg crate vertically at a constant speed to a height of 10 m. Calculate the work done by the motor on the crate. (2 Marks)

d) A roller coaster car of mass 500 kg starts from rest at a height of 40 meters.

i) Calculate the potential energy of the car at the top of the hill. (1 Mark)

ii) If it descends to ground level, find its kinetic energy just before it reaches the ground. (3 Marks)

---------- END OF QUESTIONS ----------