



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2024/2025 ACADEMIC YEAR
SECOND YEAR SECOND SEMESTER
MAIN EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE

COURSE CODE: MAA 2230

COURSE TITLE: CLASSICAL MECHANICS

DATE: 25/04/2025

TIME: 8:00 AM – 10:00 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE (30MARKS)

- a) Define the term classical mechanics: (3marks)
- i) Classical mechanics
ii) Momentum
- b) State the 3 Newton's laws of motion. (5marks)
- c) A car accelerates from rest with an acceleration of 2 m/s^2 for 5 seconds. How far does it travel? (2marks)
- d) Find the work done in moving a particle along a straight line from $(-4, 3, 2)$ to $(2, -1, 3)$ in a force field given by: (5marks)
 $F = 3i - 2j + k$
- e) A ball is playing horizontally with a velocity V_1 of magnitude 10 m/s . Find: (5marks)
 i) The position after 2 seconds
 ii) Its velocity after 3 seconds
- f) Prove that impulsive force $= \Delta$ in momentum: (5marks)
 $\int_{t_1}^{t_2} F dt = M_2 V_2 - M_1 V_1 = P_2 - P_1$
- g) Given that the acceleration due to gravity on the surface of the moon is 1.67 m/s^2 and the radius of the moon is $1.74 \times 10^6 \text{ m}$, calculate the mass of the moon. (5marks)

QUESTION TWO (20MARKS)

A particle of mass m moves in the xy plane so that its position vector is given by:
 $r = a \cos \omega t + b \sin \omega t j$

- a) Show that...
- I. The particle moves in an ellipse.
- II. The force acting on the particle is always directed towards the origin.
- b) Find the kinetic energy of the particle at points O and 90.
- c) Find the work done by the force field in moving the particle from A to B.
- d) Show that the work done in moving the particle around the ellipse is zero.