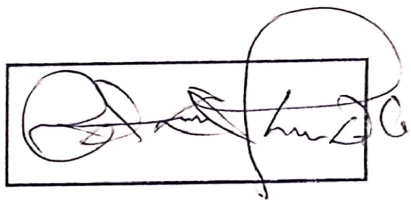
ELIZADE UNIVERSITY
ILARA-MOKIN
ONDO STATE

FACULTY: Basic and Applied Sciences
DEPARTMENT: Physical and Chemical Sciences
SECOND SEMESTER EXAMINATIONS
2016/2017 ACADEMIC SESSION

COURSE CODE: PHY 214 COURSE UNITS: 2 units

COURSE TITLE: Classical Mechanics II

DURATION: 2 hours



HOD's SIGNATURE

TOTAL MARKS: 60

Matriculation Number: _____

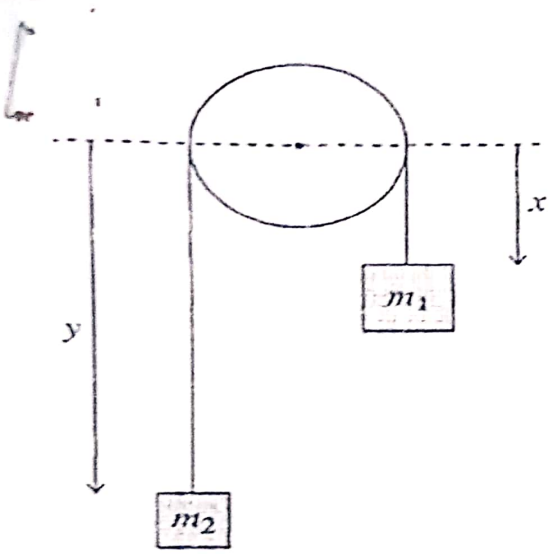
INSTRUCTIONS:

1. Write your matriculation number in the space provided above and also on the cover page of the exam booklet.
2. This question paper consists of 3 pages with printing on both sides.
3. Answer questions only in the exam booklet provided.
4. More marks are awarded for detailed solution than for the final numerical answer.
5. Box your final answers. Marks will be deducted for untidy work.
6. Attempt any (3) of the Five (5) questions. Each question is worth 20 points.
7. All approximations should be rounded up to 2 decimal places (2 d.p.)
8. Your final answers should be in S.I. units

Question 1

The Atwood machine below contains two masses m_1 and m_2 suspended by an inextensible string of length l which passes over a massless pulley with frictionless bearings and radius R.

(a) Using the newton laws of motion, find the acceleration of the system
(b) Obtain the Lagrange equation of motion and solve for the acceleration of the system.



Question 2

A one-dimensional particle moving along the x-axis is subjected to a force, F = -Kx.

(a) Write down the Lagrangian of the system
(b) Find the Lagrange equation of motion and solve it.

Question 3

Consider a free particle not under the influence of any force that is confined to move along the x axis. Using x as the generalized coordinate, find:

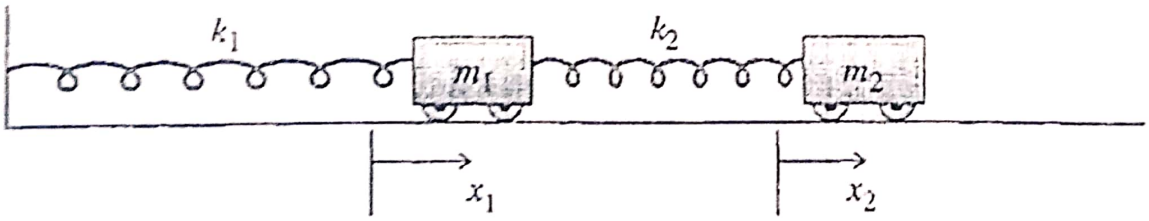
(a) the Lagrangian, generalized momentum, and Hamiltonian for the particle
(b) write and solve the Hamilton's equation of motion

Question 4

A mass on the end of a spring which is undergoing simple harmonic motion with angular frequency, ω has its displacement represented by the equation, $x(t) = B_1Cos(\omega t) + B_2Sin(\omega t)$

(a) Solve for B_1 and B_2 in terms of the initial position, x_o and velocity, v_o at t = 0.
(b) Given that the oscillator's mass, spring constant, x_o, and v_o are 0.5Kg, 50N/m, 3m, and 50m/s respectively, find the values of ω, B_1 and B_2.

Question 5



(a) Find the normal frequencies, ω_1 and ω_2, for the two carts shown in the figure above, assuming that $m_1 = m_2$, and $k_1 = k_2$.
(b) Find and describe the motion for each of the normal modes in turn