TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN INFORMATION TECHNOLOGY

APS 2103: FUNDAMENTALS OF PHYSICS.

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2019

TIME: 2 HOURS

DATE: AUGUST 2019

Instructions to Candidates
You should have the following for this examination
-*Answer Booklet, examination pass and student ID*
This paper consists of FIVE questions. Attempt question ONE (compulsory) and any other TWO questions.
Do not write on the question paper.
Take $g = 10m/s^2$

$K_e = 9.00 \times 10^9 Nm^2/C^2$

QUESTION ONE (30MKS)

a) Differentiate between a dimension and a unit (2mks)

b When a mass is attached to a spring, the acceleration is $a = k\,x/m$ where a is acceleration, x is a length, m is mass, and k is a spring constant. Find the units of k. (3mks)

c)A particle moving with a velocity of $20ms^1$ is brought to rest in 0.02 s. calculate the acceleration of the body, hence the retardation. (3mks)

c)A current of 0.5A flows through a 10Ω resistor. What is the voltage across the resistor? (3mks)

d) A generator produces a voltage of 600 V. The primary coil in a transformer has 20 turns. How many secondary turns are needed to step up the voltage to 2400 V? (3mks)

e) Differentiate between electromotive force and potential difference. (2mks)

f) Explain with the aid of a diagram forward bias as used in electronics (3mks)

g) Define the following terms

    i)   Mechanics (1mk)

    ii) Acceleration (1mk)

h) Other than temperature state any other **two** factors that affect the resistance of an Ohmic conductor. (2mks)

i) Calculate the strength and the direction of the electric field E due to a point charge of 2.00nC at a distance of 5.00mm from the charge (4mks)

l) Explain the Heating Effect of an electric current (3mks)

QUESTION TWO (15MKS)

a) p- type and n-type semiconductors are made from a pure semiconductor by a process known as "doping". What is doping? (1mk)

b) Distinguish between intrinsic and extrinsic semiconductors. (2mks)

c) Explain how doping produces a p-type semi conductor for pure semi conductor material.
(3mks)

f)A capacitor is always connected across the output during rectification. Explain its effect on the output. (2mks)

(i) With a well labelled diagram shows how a junction diode is formed (2mks)

  (ii) Explain why a junction diode only conducts in one way (2mks)

c) (i) State what is meant by breakdown voltage for a diode (1mk)

(ii) Name two applications of a junction diode (2mks)

QUESTION THREE (15MKS)

a)Give any three applications of capacitors (3mks)

b) Define the term capacitance (1mk)

c) Three capacitors of capacitance 3µF, 4µF and 6µF are connected to a potential difference of 24V as shown below.
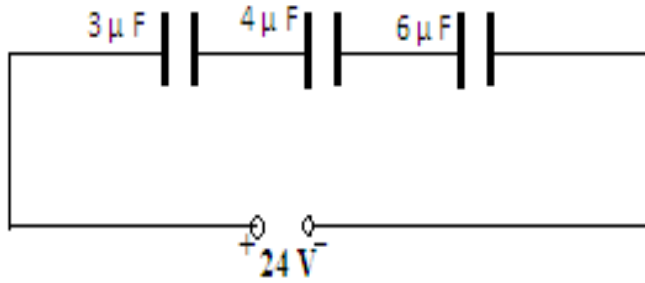
i) The combined capacitance (3mks)

ii) The total charge (2mks)

iii) The charge on each capacitor (1mk)

iv) The voltage across the 4µF capacitor (2mks)

d) State **three** factors that determine the capacitance of a parallel plate capacitor. (3mks)

QUESTION FOUR (15MKS)

a) Define electric field and give its SI unit (2mks)

b) Two point charges are 5.0 m apart. If the charges are 0.020 C and 0.030 C, what is the force between them and is it attractive or repulsive? (4mks)

c) Calculate the strength of the electric field E due to a point charge Q of 2.00µC at a distance of 50cm from the charge (4mks)

d) i) Define the term electrostatic potential (1mk)

ii) What is the electric potential 5.0m from a point charge q = 3.5µC? (4mks)

QUESTION FIVE (15MKS)

a)   Give the structural features in transformer design which help in achieving high efficiency. (4mks)

b)   The primary coil of a transformer has 1200 turns and the secondary coil has 60 turns. The transformer is connected to a 240V a.c source. Determine:

i) The output voltage.   (3mks)

ii) The output current when the primary coil has a current of 0.5A. (Assume there are no energy losses.)   (3mks)

c)   A single loop circuit contains two resistors and two batteries as shown in the figure below. (Neglect the internal resistance of the batteries). Find the current in the circuit.   (5mks)