KIBABII UNIVERSITY

ACADEMIC YEAR……2019/2020 MAIN CAMPUS

DEPARTMENT……..OF SCIENCE TECHNOLOGY AND ENGINEERING

COURSE CODE: SPH 217

COURSE TITLE:INTRODUCTION TO ELECTRICITY AND MAGNETISM MAIN PAPER

DATE: 3/02/2021 **TIME:** 2:00-4:00Pm

INSTRUCTIONS TO CANDIDATES

Answer ALL questions in ONE and ANY TWO questions from the remaining

DURATION: 2Hours

KIBABII observes ZERO tolerance to examination cheating

QUESTION ONE

(a) Define the following terms:
   (i) The point charge.
   (ii) Volume charge density
   (iii) Surface charge density. (3mks)

(b) By the help of the diagram, state the coulombs law for two point charges (5mks)

(c) Show that the relationship between e-field and V is $V_{AB} = \int_A^B -dL.$ (5mks)

(d) State the Gauss law. (3mks)

(e) Given that $E = -\nabla V$ and $V.E = \frac{\rho}{\epsilon_0}$, find poisons and Laplace equations (4mks)

(f) Use the Gauss law to deduce the electric field of point charge. (5mks)

(g) List any three forms of Maxwell equations. (3mks)

(h) Draw electric field lines of a point charge (2mks)

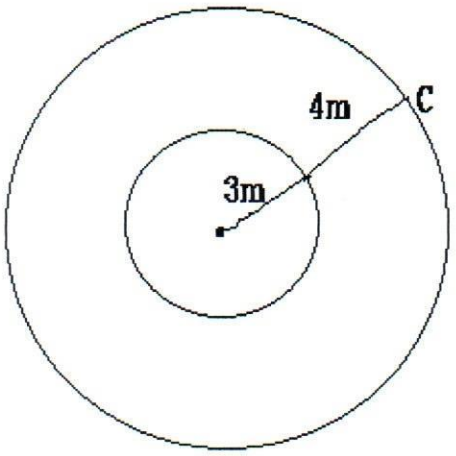
QUESTION TWO

(a)Name and explain the three Faradays experiments (9mks)

(b) What is the qualitative treatment of an E- field on a dielectric material (5mks)

(c)A sphere with a uniform volume charge distribution $\rho = 3C/m^3$has a radius of 3m. What is the electric field at point C

(4mks)



(d) Define dielectric breakdown and dielectric strength. (2mks)

QUESTION THREE

(a) State four Maxwell equations both in integral and differential form. (8mks)

(b) Show that amperes circuital law in the presence of magnetic material is $\oint \left(\frac{B}{\mu_0} - M\right).dL = I_c$ (6mks)

(c) (i) Define the Bio-savart's law (2mks)

(ii) Calculate the magnetic field at a point on the center of the circular conductor of radius 2m with a current of 8A. (4mks)

QUESTION FOUR

(a)Define capacitors. (2mks)

A capacitor of capacitance $10\mu F$ is fully charged from 20V d.c supply

(b)(i) Calculate the charge stored by the capacitor (3mks)

(ii) Calculate the energy delivered by 20 V supply (3mks)

(iii)Calculate the energy stored in the capacitor (3mks)

(iv)Explain the difference between part (ii) and(iii) (3mks)

(v)How much work is required to bring together the three charges from infinity to the corners of an equilateral triangle of side length 1cm? Given q_1=1μC, q_2=2μC, q_3=3μC and k=9×10^9N. (4mks)

(v) Define dielectric material. (2mks)

QUESTION FIVE

(a)Point charges of $8\times 10^{-9}\ c, -2\times 10^{-9}\ c$ and $4\times 10^{-9}\ c$ are placed at coordinate $(1,0),(0,1),(0,-1)$ respectively. Calculate their forces and electric field. 6mks)

(b)(i)state the Gauss law for E-field in the integral form (2mks)

(ii) Explain some two consequences of Gauss that is applied to conductors. (6mks)

(iii)Proof that $V_{AB} = \int_A^B -E.dL$ (6mks)