



DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

UNIVERSITY EXAMINATIONS FOR 2015/2016

**FIRST YEAR SPECIAL/ SUPPLEMENTARY EXAMINATIONS FOR THE DEGREE OF
BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF SCIENCE IN
INFORMATION TECHNOLOGY**

SPH 2172: PHYSICS

DATE: 5TH JULY 2016

TIME: 2.00-4.00 PM

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Instructions:

1. Answer Question **one** and any other **two** questions
2. Use SI units and standard notation only
3. No free-hand diagrams allowed

Some useful constants

- a) Charge of an electron $e = 1.6 \times 10^{-19} \text{C}$
- b) Speed of light $c = 3.0 \times 10^8 \text{ m/s}$
- c) Permittivity of free space $\epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}$

QUESTION ONE

COMPULSORY

(30 marks)

- a) Define the following terms
 - i) Power
 - ii) Inductance
 - iii) Current density
 - v) Vector . **(4 marks)**
- b) State 3 characteristics of a conductor in an electric field. **(3 marks)**
- c) An inductor of 33mH is connected across a 120V root means square 60 Hz AC supply .Calculate
 - i. The peak voltage **(3 marks)**

- ii. The current at $t=0.008$ seconds. (4 marks)
- e) State and explain three factors that determine the amount force on a charge in a magnetic field. (3 marks)
- f) State and explain three factors that determine the magnitude of magnetic force on a conductor carrying current in a magnetic field. (3 marks)

QUESTION FOUR OPTIONAL (20 marks)

- a) State
- (i) Coulomb's law (1 mark)
- (ii) Three uses of capacitor (3 marks)
- b) A capacitor system is made of 2 plates each of area of 1.5cm^2 . The dielectric is 5mm thick. The capacitor is connected across 300V DC supply and its dielectric constant is 4. Determine
- i. The capacitance of the capacitor (3 marks)
- ii. Electric flux density of the dielectric. (3 marks)
- iii. The electric field strength in the dielectric (3 marks)
- iv. The energy stored by the capacitor. (3 marks)
- c) Four points particles with charges $0.6\mu\text{C}$, $2.2\mu\text{C}$, $-3.6\mu\text{C}$, $+4.8\mu\text{C}$ are placed at the corners of an square of side 10cm . Determine the external work needed to bring a charge of $-0.5\mu\text{C}$ from infinity to the centre of the square. Show that this work does not depend on which charge is at which corner. (4marks)

QUESTION FIVE OPTIONAL (20 marks)

- a) Define the following terms
- i. Period of oscillation
- ii. Angular frequency (2 marks)
- b) An AC signal which has a frequency $f = 50\text{Hz}$ and peak value of 230 V is applied to a series R-C circuit, where $R = 40\ \Omega$ and $C = 0.033\mu\text{F}$
- Calculate
- i. The capacitive reactance. (3 marks)
- ii. The circuit impedance. (3 marks)
- iii. Root mean square current (3 marks)
- iv. The phase angle (3 marks)
- c) Explain two ways how power loss is reduced in AC transmission (6 marks)

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