MURANG'A UNIVERSITY COLLEGE

(A Constituent College of Jomo Kenyatta University of Agriculture and Technology)

DEPARTMENT: **ELECTRICAL ENGINEERING**

LEVEL: **DIPLOMA**

CLASS: **MRUC/ME/P/14DS**

TERM/SEMESTER: **I1**

ACADEMIC YEAR: **2014/2015**

UNIT: **ELECTRICAL SCIENCE II**

UNIT CODE: **SEM 1202**

TIME: **2 HOURS**

DATE: **21ST AUGUST 2015**

Instructions to candidates

This paper contains four (4) questions

Question 1 is compulsory

Answer any other 2 questions

You should have the following for this examination;

- Drawing instruments
- Scientific calculator

Mobile Phones Not Allowed In Exam Room

1. (a) Define the following terms:
   i. Unidirectional waveform
   ii. Alternating waveform
   iii. Period, T.
   iv. Frequency
   v. Amplitude
   vi. Instantaneous value
   vii. Peak-to-peak value **(7marks)**

   (b) An alternating current completes 5 cycles in 8ms. Determine its frequency? (**3marks)**

   (c) An alternating voltage is given by V = 75sin (200πt – 0.25) volts. Find:
   (i) The periodic time, T (ii) The peak-to-peak value (iii) The r.m.s value
   (iv) The phase angle in degrees and minutes relative to 75sin200πt. **(10marks)**

   (d) The current in a.c circuit at any time t seconds is given by
   i = 120sin (100πt +0.36) amperes
   Find:
   The peak value, the periodic time, the frequency and phase angle relative to 120sin100πt.
   (**10marks**)

2. (a) Determine the capacitive reactance of a capacitor of 10μF when connected to a Circuit of frequency 20 kHz. **(2marks)**

   (b) A coil of inductance 159.2mH and resistance 20Ωis connected in series with a 60Ω resistor to a 240V, 50Hz supply. Determine:
   i. The impedance of the circuit
   ii. The current in the circuit
   iii. The circuit phase current
   iv. The potential difference across the60Ω resistor
   (12marks)

   (c) Describe the following moving-iron instrument with aid of labelled diagrams.

   (i) Attraction type
   (ii) Repulsion **(6marks)**

3. (a) Define the term Q – factor**.** **(2marks)**

   (b) A capacitor C is connected in series with a 40Ω resistor across a supply voltage of frequency 60Hz. A current of 3 A flows and the circuit impedance is 50Ω.
   Calculate:
   (i) The value of the capacitance, C.
   (ii) The supply voltage
   (iii) The phase angle between the supply voltage and current
   (iv) The potential difference across the resistor
   (v) The potential difference across the capacitor
   (vi) Draw the phasor diagram **(18 marks)**

4. (a). A 5KVA single phase transformer has turns ratio of10:1 and is fed from a 2.5KV supply. Neglecting losses, determine ;

(i) **The** full load secondary current

(ii) Minimum load c urrent which can be connected across the secondary winding to give full load KVA

(iii) The primary current at full load KVA. **(12marks)**

(b) Describe the construction and principle of operation of a transformer with an aid of diagram. **(8marks)**