



## MURANG'A UNIVERSITY COLLEGE

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

**DEPARTMENT:** ELECTRICAL ENGINEERING

**LEVEL:** DIPLOMA  
**CLASS:** MRUC/ME/P/14DM  
**TERM/SEMESTER:** I1  
**ACADEMIC YEAR:** 2014/2015  
**UNIT:** ELECTRICAL PRINCIPLES II  
**UNIT CODE:** SME1205  
**DATE:** 24<sup>TH</sup> APRIL 2015 **TIME:** 2 HOURS

### *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 **(7mks)**
- (b) An alternating current completes 5 cycles in 8ms. Determine its frequency? **(3mks)**
- (c) An alternating voltage is given by  $V = 75\sin(200\pi t - 0.25)$  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  $75\sin 200\pi t$ . **(10mks)**

(d) The current in a.c circuit at any time  $t$  seconds is given by  
 $i = 120\sin (100\pi t + 0.36)$  amperes

Find:

i. The peak value, the periodic time, the frequency and phase angle relative to  $120\sin 100\pi t$ . **(10mks)**

2. (a) Determine the capacitive reactance of a capacitor of  $10\mu\text{F}$  when connected to a circuit of frequency 20 kHz. **(2mks)**

(b) A coil of inductance  $159.2\text{mH}$  and resistance  $20\Omega$  is connected in series with a  $60\Omega$  resistor to a  $240\text{V}$ ,  $50\text{Hz}$  supply. Determine:

- i. The impedance of the circuit
- ii. The current in the circuit
- iii. The circuit phase current
- iv. The potential difference across the  $60\Omega$  resistor

**(12mks)**

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

(i) Attraction type

(ii) Repulsion

**(6mks)**

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

(b) A capacitor  $C$  is connected in series with a  $40\Omega$  resistor across a supply voltage of frequency  $60\text{Hz}$ . A current of  $3\text{A}$  flows and the circuit impedance is  $50\Omega$ .

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 mks)**

4. (a). A  $5\text{KVA}$  single phase transformer has turns ratio of  $10:1$  and is fed from a  $2.5\text{KV}$  supply. Neglecting losses, determine ;

(i) The full load secondary current

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

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

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

