# MURANG'A UNIVERSITY COLLEGE

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

**DEPARTMENT**: ELECTRICAL ENGINEERING

**LEVEL:**            **CERTIFICATE**

**CLASS:**            **MRUC EE/P/14CM**

**TERM/SEMESTER:**     **III**

**ACADEMIC YEAR:**     **2014/2015**

**UNIT:**             **ELECTRICAL PRINCIPLES II**

**UNIT CODE:**       **EE0111**

**DATE: 22ND APRIL 2015**          **TIME:**    **2 HOURS**

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*Instructions to candidates*

This paper contains FOUR (4) questions, and TWO SECTIONS

Section A is Compulsory and attempt any Two Questions from Section B

Answer all the questions

You should have the following for this examination;

- Drawing instruments
- Scientific calculator

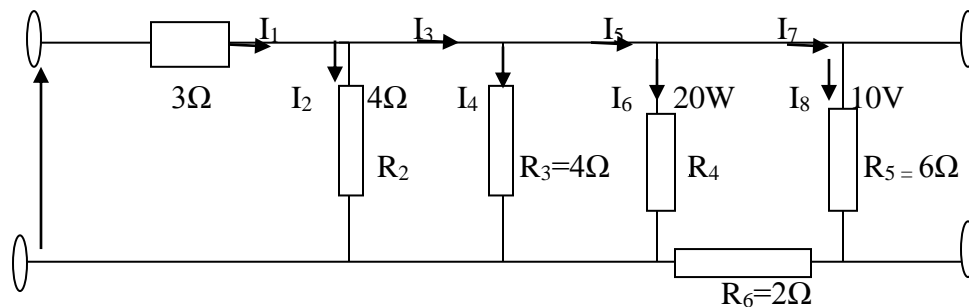    Mobile Phones are not allowed in Exam Room.

    ## SECTION A

    a) Explain the following Kirchoffs laws
        i   Kirchoffs Current Law
        ii.. Kirchoffs Voltage Law               (2mks)

    b) For the Network shown below, calculate the following

I Supply Voltage

II Power developed across 3Ω Resister

III $I_1, I_2, I_4, I_6$ and $I_8$ (8mks)

(c) The current flowing through a resistor of 5kΩ ± 0.4% is measured as 2.5mA with an accuracy of measurement of ±0.5%. Determine the nominal value of the Voltage across resistor and its accuracy. **(4 mks)**

(d) 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 **(7 mks)**

(e) An alternating current completes 5 cycles in 8mS. What is its frequency? **(3 mks)**

(f) 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 $75\sin 200\pi t$. **(6 mks)**

## SECTION B

2(a) Determine the capacitive reactance of a capacitor of 10μF when connected to a circuit of frequency 20 kHz. **(4 mks)**

(b) A coil of inductance 159.2mH and resistance 20Ω is 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 p.d across the 60Ω resistor **(16 mks)**

3. 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)**

|      | ii.  | The value of the current when t=8m | **(5mks)** |
| ---- | ---- | ---------------------------------- | ---------- |
|      | iii. | The time when the current first reaches 60A. | **(5 mks)** |

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

   (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 p.d across the resistor

   (v) The p.d across the capacitor

   (vi)  Draw the phasor diagram                **(18 mks)**