TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

EEP 2104 CIRCUIT THEORY II

SERIES: MAY 2016

Instructions

- This paper consists of FIVE questions
- Answer any THREE questions
- All Questions carry equal marks

QUESTION ONE

(a)   A coil having resistance of 10Ω and inductance of 0.2H is connected in series with a capacitor of capacitance 80µF across a 240V, 50Hz supply. Draw the circuit diagram and calculate:
      i.   The current in the circuit
      ii.   Voltages V_R, V_L, and V_C
      iii.   The phase angle and draw the phasor diagram   (11 marks)
(b) Distinguish between average value and instantaneous value   (4 marks)
(c) Explain the following terms and give their expressions.
      i.   RMS value
      ii.   Form factor   (5 marks)

QUESTION TWO
(a)   With the aid of diagrams explain the functions of the following in analogue instruments
      i.   Air current damping device
      ii.   Control device   (8 marks)

(b)   A coil of conductor is rotating within a magnetic field. Draw the sine wave and the generated emf is given by $e = 2\pi BAnNsin\theta$ (6 marks)
(c) (i)   Explain the importance of power factor improvement in ac circuits.
    (ii)   Draw the phasor diagrams for each of the following circuits:
      I.   Ac circuit having resistance only
      II.   Ac circuit having inductance only
      III.   Ac circuit having capacitance only   (7 marks)

QUESTION THREE
(a)   A resistance of 15Ω, an inductance of 0.18H and a capacitance of 60µF are connected in parallel across a 220V, 50Hz supply. Calculate:
      i.   The current on each branch
      ii.   The supply current
      iii.   The phase angle and draw the phasor diagram   (11 marks)
(b)Explain the following terms:
      i.   Admittance
      ii.   Reluctance
      iii.   Susceptance   (3marks)

(c)   A resistance of 20Ω, an inductance of 0.12H and capacitance of 50µF are connected in series. Calculate the impedance using:
      i.   Rectangular notation
      ii.   Polar notation   (6 marks)

QUESTION FOUR

(a)   For the circuit of figure Q4a, calculate

       i.   Current in each line

      ii.   The current in the neutral conductor   (12 marks)
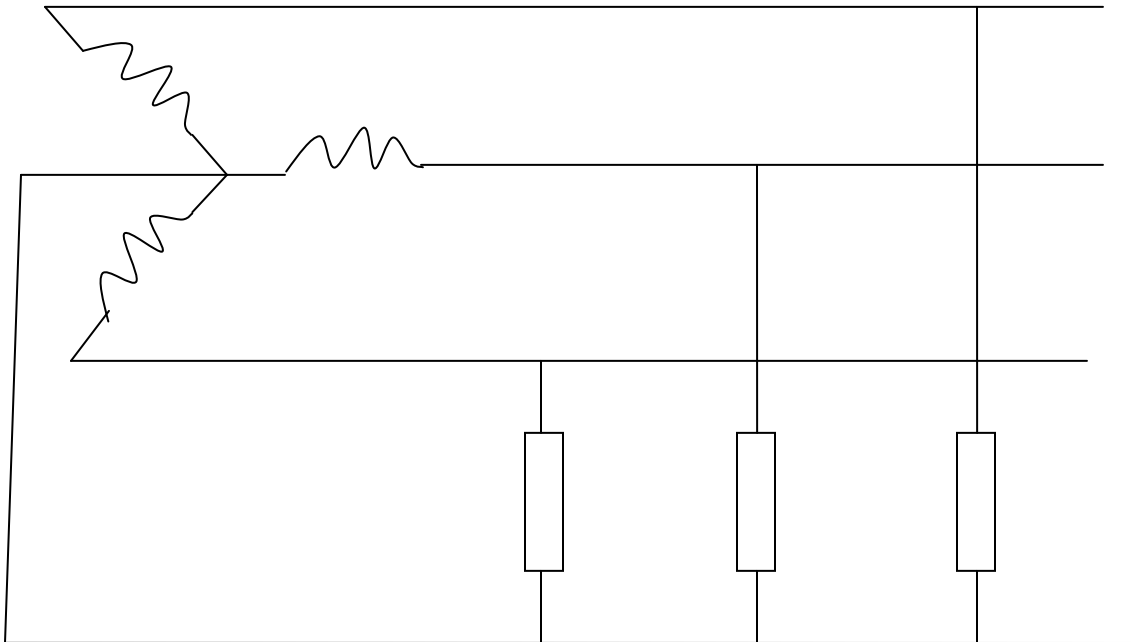
(b)   Draw the waveforms for three phase emfs and state expressions for line and phase currents in:

       i.   Star- connected supply

      ii.   Delta connected supply

                                                (8 marks)

QUESTION FIVE

(a) (i)   State the expression for power in a three phase system

    (ii)   A three phase delta connected motor operating off a 415V system is developing 25kW at an efficiency of 0.95p.u. and a power factor of 0.9. Calculate:

       I.   The line current

      II.   The phase current   (6 marks)

 (b) With the aid of a diagram explain the operation of a permanent magnet moving coil instrument.

                                              (7 marks)

(c)   With the aid of a diagram explain the two-meter method of power measurement in three phase systems.   (7 marks)