SEM 1 – 4 (RC 07-08)

F.E. Semester – I (Revised in 2007-08) Examination, May/June 2015
BASIC ELECTRICAL ENGINEERING

Duration : 3 Hours | Total Marks : 100

Instructions : *1) Answer **any five** questions with atleast **one** question from **each** module.*
*2) Assume suitable additional data if **necessary**.*

MODULE – I

1. a) Define capacitance from its energy and geometrical viewpoints. Derive the expression for equivalent capacitance, when two capacitances are connected in series. **6**

   b) R_1, R_2 and R_3 are the resistances of the three arms of a star. The star is converted into an equivalent delta, the resistances of which are R_a, R_b and R_c. Derive the expressions for R_a, R_b and R_c in terms of R_1, R_2 and R_3. **6**

   c) Using Thevenin's theorem, find the current in the 20 Ω resistor for the circuit given in fig (1c). **8**

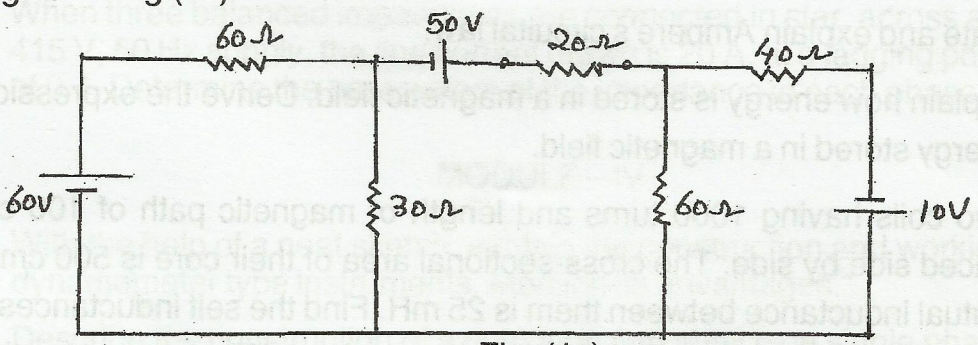

Fig. (1c)

2. a) State the explain Norton's theorem with the help of neat sketches. **6**

   b) In the circuit given in fig. (2b), find the value of resistance R if the current flowing through it is 0.8 Amps. **6**

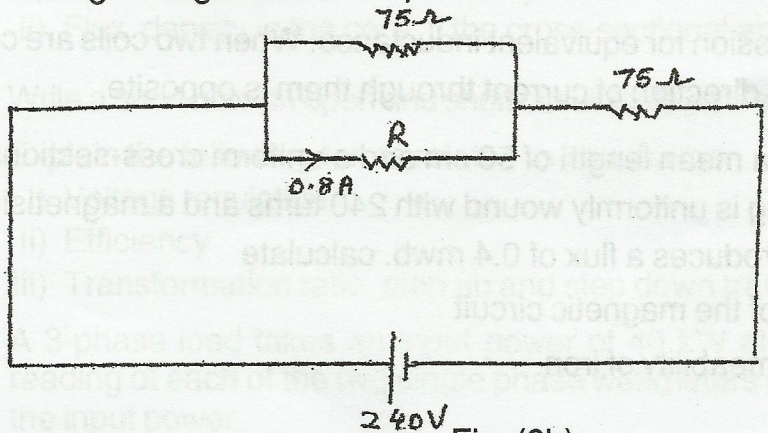

Fig. (2b)

P.T.O.

c) An inductor of 0.1 H has current waveform as shown in fig. (2c). Sketch the voltage waveform in time synchronism across the inductor. 8

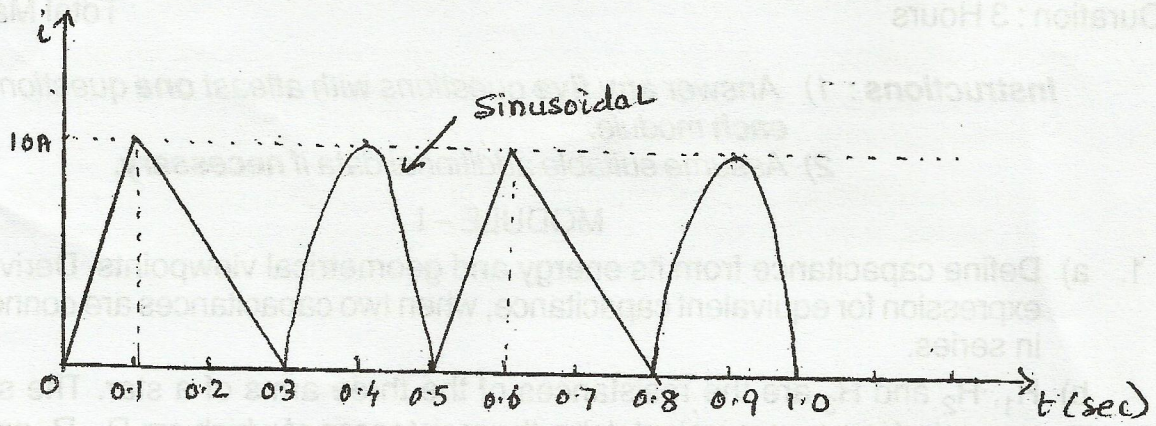

Fig. (2c)

MODULE – II

3. a) State and explain Ampere's circuital law. 6

b) Explain how energy is stored in a magnetic field. Derive the expression for energy stored in a magnetic field. 7

c) Two coils having 1000 turns and length of magnetic path of 100 cm are placed side by side. The cross-sectional area of their core is 500 cm^2. The mutual inductance between them is 25 mH. Find the self inductances of the coils and the coefficient of coupling between them. What are magnetically coupled coils ? 7

4. a) State the similarities and differences between electric and magnetic circuits. 8

b) Derive the expression for equivalent inductance. When two coils are coupled in series and the direction of current through them is opposite. 6

c) An iron ring has a mean length of 50 cm and a uniform cross-sectional area of 5 cm^2. The ring is uniformly wound with 240 turns and a magnetising current of 2A, produces a flux of 0.4 mwb. calculate 6

i) Reluctance of the magnetic circuit

ii) Relative permeability of iron.

MODULE – III

5. a) Derive the relationships between phase and line currents and also between phase and line voltages in a delta connected balanced three phase system. **8**

   b) The expressions for instantaneous values of two currents are given by $i_1 = 30 \sin(\omega t + 60°)$ and $i_2 = 10 \sin(\omega t - 45°)$. Find the expression for the instantaneous value of resultant current by addition of the two currents. **5**

   c) A circuit consists of a resistance of $20\,\Omega$, an inductance of 0.05 H connected in series. A supply of 230 V at 50 Hz is applied across the circuit. Find the current, power factor and power consumed by the circuit. Draw the phasor diagram. **7**

6. a) Explain the concept of phasors and show how an ac quantity can be represented by a phasor. **6**

   b) Show that, in a single phase c-circuit, the current leads the applied voltage by 90°. Draw the phasor diagram and the waveforms of instantaneous values of voltage and current. **7**

   c) When three balanced impedances are connected in star, across a 3-phase, 415 V, 50 Hz supply, the line current drawn is 20 A, at a lagging power factor of 0.4. Determine the parameters of the impedance in each phase. **7**

MODULE – IV

7. a) With the help of a neat sketch, explain the construction and working of dynamometer type instruments. Mention its advantages. **10**

   b) Describe the construction of a core type and shell type single phase transformer. **6**

   c) The primary winding of a 25 KVA transformer has 200 turns and is connected to 230 V, 50 Hz supply. The secondary turns are 50. Calculate : **4**
      i) Full load primary and secondary currents
      ii) Flux density in the core, if the cross-sectional area of the core is 60 cm^2.

8. a) Write a short note on open and short circuit tests on a single phase transformer. **8**

   b) Explain the following terms related to transformer.
      i) Voltage regulation
      ii) Efficiency
      iii) Transformation ratio, step up and step down transformer. **6**

   c) A 3-phase load takes an input power of 40 kW at 0.45 P.F. lag. Find the reading of each of the two single phase wattmeters connected to measure the input power. **6**
