F.E. (Semester – I) (Revised in 2007-08) Examination, May/June 2014
BASIC ELECTRICAL ENGINEERING

Duration : 3 Hours | Total Marks : 100

Instructions : *1) Answer **any five** questions with at least **one** question from **each** Module.*
*2) Assume additional data **if necessary**.*

MODULE – I

1. a) State and prove maximum power transfer theorem. **6**

   b) For the circuit given in fig. (1. b), find the charge on each capacitor. **6**

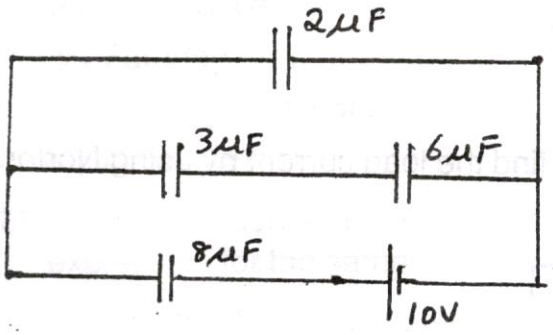

Fig. (1. b)

   c) For the given current waveform as shown in fig. (1. c), plot the voltage waveform across each circuit element in the network. **8**

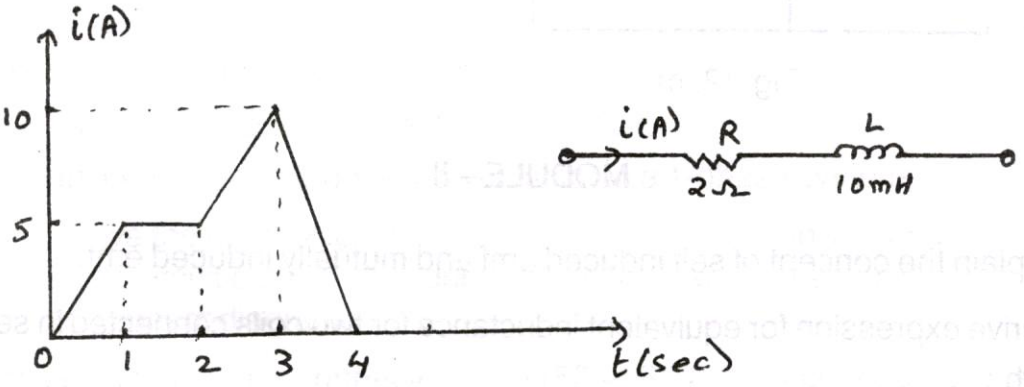

Fig. (1. c)

2. a) Define capacitance from circuit, energy and geometrical viewpoint. 6

   b) For the network shown in Fig. (2. b) find the equivalent resistance between terminals A and B. 6

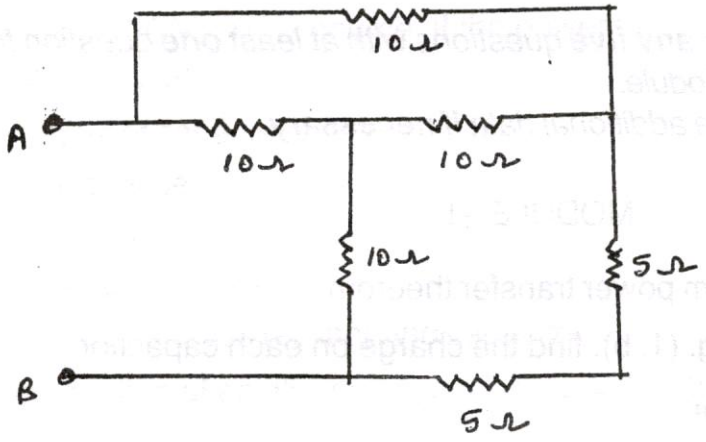

Fig. (2. b)

   c) For the circuit shown in Fig. (2. c), find the load current by using Norton's theorem and Thevenin's theorem. 8

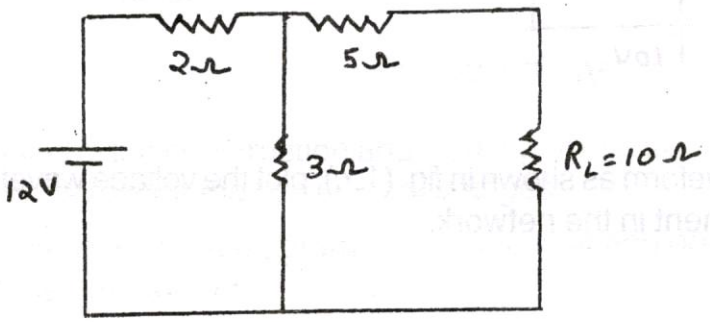

Fig. (2. c)

MODULE – II

3. a) Explain the concept of self induced emf and mutually induced emf. 6

   b) Derive expression for equivalent inductance for two coils connected in series with : 7

      i) Current flowing through them in same direction.

      ii) Current flowing through them in opposite direction.

c) A flux of 0.5 m wb is produced by a coil of 900 turns wound on a ring with a current of 3A in it. Calculate :

i) Inductance of the coil.

ii) emf induced in the coil, when a current of 5A is switched off, assuming the current to fall to zero in 1 m sec.

iii) The mutual inductance between the coils, if a second coil of 600 turns is uniformly wound over the first coil. **7**

4. a) Explain the following as related to magnetism :

i) Magnetic potential

ii) Magnetic field intensity

iii) Flux density

iv) Reluctance

v) Faraday's law of electromagnetic induction

vi) Fleming's left hand rule

vii) Lenz's law. **7**

b) Discuss the concept of energy storage in a magnetic field. Derive the expression for the same. **7**

c) An iron ring of circular cross-section have internal diameter 12 cm and external diameter 18 cm. A coil of 1000 turns is wound on the ring. If the magnetic flux in the core is 0.5 m wb, then find the current in the coil. Assume relative permeability of core as 1200. **6**

MODULE – III

5. a) Explain the following concepts : **6**

i) Phase sequence in a 3-phase circuit.

ii) Leading and lagging power factor in a 1-phase system.

b) Derive the expression for instantaneous current and instantaneous power in an ac circuit containing inductance only. Draw neat and labelled waveforms and phasor diagram. **7**

c) A balanced star connected load $(50 + j94.2)\,\Omega$ is connected to a 3 phase, 415 V, 50 Hz supply. Calculate :

i) Line currents ii) Phase currents

iii) Power factor iv) Total power. **7**

6. a) In a delta connected, three phase system derive the relation between line voltage and phase voltage, line current and phase current and the expression for total power consumed. 8

   b) A 120 Ω resistor is placed in series with a capacitor and the circuit is connected across a 120 V, 60 Hz source. If the power factor is 0.91, then calculate
      i) Phase angle
      ii) Value of capacitor
      iii) Impedance
      iv) Current
      v) Power consumed
      vi) Voltage across resistor and capacitor. 8

   c) The equation of an alternating current is i = 42.42 sin 628 t. Determine :
      i) Its maximum value
      ii) Frequency
      iii) rms value
      iv) Average value
      v) Form factor. 4

MODULE – IV

7. a) Describe the construction and working of electrodynamometer instrument. Give its advantages and disadvantages. 9

   b) Explain with neat diagram the short circuit and open circuit test on a single phase transformer. 7

   c) Two wattmeter method is used to measure the power taken by a three phase ac load. The wattmeter readings are 375 w and – 30 w. Calculate
      i) Power factor of the load
      ii) Phase difference of voltage and current. 4

8. a) With the help of a neat phasor diagram explain the working of a single phase transformer on load. 7

   b) Derive the emf equation in a single phase transformer. 6

   c) A single phase transformer with a ratio of 440/110 V takes a no. load current of 5 A at 0.2 power factor lagging. If the secondary supplies a current of 120 A at a power factor of 0.8 lagging, estimate the current taken by the primary. 7
