SEM 1 – 4 (RC 07-08)

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

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 inductance from its Energy Geometrical view points.

   Derive the expression for equivalent inductance, when two inductances are connected in parallel. **6**

   b) R_1, R_2 and R_3 are the resistances of the three branches of a delta. The delta is converted into an equivalent star, 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, calculate the current in the 104 Ω resistor for the circuit given in Fig (1c). **8**

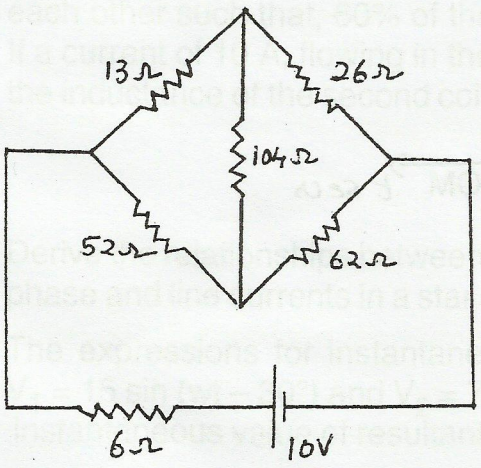

Fig. (1c)

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

b) In the series-parallel circuit shown in Fig. (2b), find :

i) The voltage drop across the 4Ω resistor

ii) The supply voltage. 7

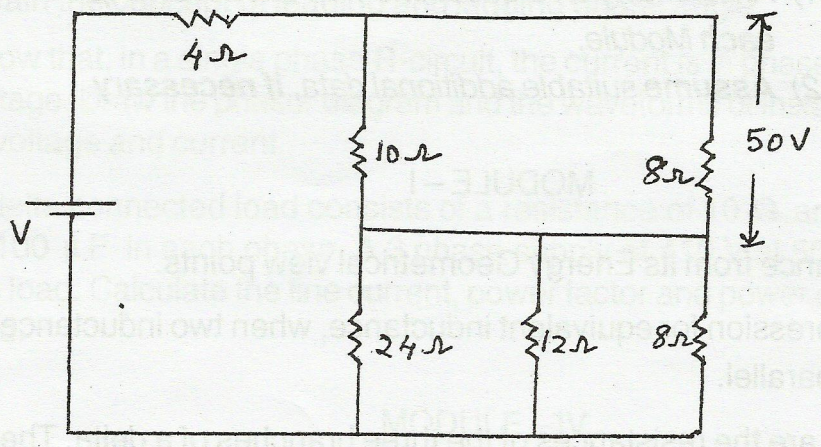

Fig. (2b)

c) The voltage waveform as shown in Fig (2c) is applied across a pure inductor of 0.5 H. Sketch the current wave shape in time synchronism over the specified time interval. 7

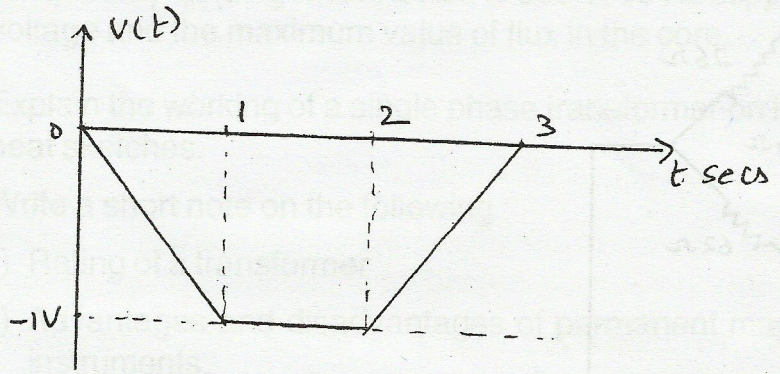

Fig. (2c)

MODULE – II

3. a) Explain :
   i) Faraday's law
   ii) Lenz's law
   iii) Fleming's left hand rule. 6

   b) What are magnetically coupled circuits ? Derive the expression for coefficient of magnetic coupling between two coils with L_1 and L_2 as their self inductances. 8

   c) A coil of 500 turns and resistance 20 Ω is wound uniformly on an iron ring of mean circumference 50 cm and cross-sectional area of 4 cm^2. It is connected to a 24 V dc supply. The relative permeability of iron is assumed to be 800. Calculate the values of :
   i) MMF of coil
   ii) Magnetising force
   iii) Total flux. 6

4. a) Distinguish between self induced emf and mutually enduced emf. Explain with neat sketches. 6

   b) Explain the concept of self inductance. Derive expression for coefficient of self inductance interms of reluctance and number of turns. Define coefficient of mutual inductance. 7

   c) Two coils having 1000 turns and 1600 turns respectively are placed close to each other such that, 60% of the flux produced by one coil links the other. If a current of 10 A, flowing in the first coil, produces a flux of 0.5 mwb, find the inductance of the second coil. 7

MODULE – III

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

   b) The expressions for instantaneous values of two voltages are given by $V_1 = 15 \sin (wt - 30°)$ and $V_2 = 7 \sin (wt - 45°)$. Find the expression for the instantaneous value of resultant voltage by substraction of the two voltages. 5

   c) A circuit consists of a resistance of 25Ω and a capacitance of 100μF connected in series. A supply of 200 V and 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 following terms related to ac quantities :

i) Phase difference

ii) Phase angle

iii) Active power

iv) Reactive power.

Explain the concept of leading and lagging phase angle. 7

b) Show that, in a single phase R-circuit, the current is in phase with the applied voltage. Draw the phasor diagram and the waveforms of instantaneous values of voltage and current. 7

c) A delta connected load consists of a resistance of 10 Ω and a capacitance of 100 μF in each phase. A 3 phase supply of 410 V at 50 Hz is applied to the load. Calculate the line current, power factor and power consumed by the load. 6

MODULE – IV

7. a) With the help of a neat sketch, explain the construction and working of attraction type moving iron instrument. Mention its advantages. 10

b) Derive the emf equation for a single phase transformer. Mention the assumptions made. 6

c) A 100 KVA, 50 Hz, single phase transformer has a turns ratio of 1000/250. The primary winding is connected to 500 V, 50 Hz supply. Find the secondary voltage and the maximum value of flux in the core. 4

8. a) Explain the working of a single phase transformer on load with the help of neat sketches. 8

b) Write a short note on the following : 6

i) Rating of a transformer

ii) Advantages and disadvantages of permanent magnet moving coil type instruments.

c) Two wattmeters are connected to measure an input power of 10,384 watts at 0.8 lag power factor. Find the readings of the two wattmeters. 6