F.E. (Semester – I) (RC 2007-08) Examination, Nov./Dec. 2018
BASIC ELECTRICAL ENGINEERING

Duration : 3 Hours | Max. 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 and capacitance from their circuit, energy and geometrical viewpoints. **6**

   b) State and explain Kirchhoff's laws. **6**

   c) Find the Thevenin equivalent circuit between terminals A and B for the network shown in fig.(1c). Also calculate the current flowing through the 6.4Ω resistor. **8**

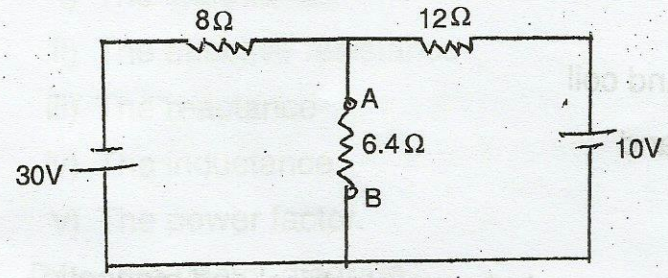

Fig. (1c)

2. a) State and explain Norton's theorem. **6**

   b) Two resistances 20Ω and 40Ω are connected in parallel. A resistance of 10Ω is connected in series with the combination. A voltage of 200V is applied across the circuit. Draw the circuit. Find the current in each resistance and the voltage across 10Ω resistor. Find also the power consumed in all the resistances. **6**

c) Find the current flowing through the galvanometer G, in the wheatstone bridge network shown in the fig (2c). 8

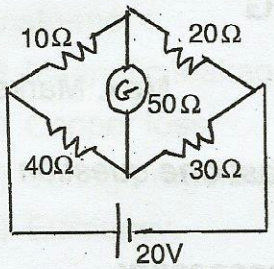

Fig (2c)

MODULE – II

3. a) State and explain Lenz's law. What are its applications. 6

b) Derive an expression for coupling coefficient between two coils. 7

c) An iron core has a mean cross-sectional area of 0.005 sq.m. and a mean circumference of 0.2m. The iron core has a relative permeability of 16000. It is wrapped with 300 turns of wire carrying 0.5 A of current. Calculate :

i) Reluctance of the core

ii) Inductance of the core and coil

iii) Magnetic field intensity and

iv) Magnetic flux density. 7

4. a) State the similarities and differences between electrical and magnetic circuits. 7

b) Explain the following :

i) Magnetic potential

ii) Magnetic field strength

iii) Fleming's left hand rule.

iv) Faraday's laws

v) Self induced emf

vi) Mutually induced emf. 6

c) The total inductance of two coils P and Q when connected in series is 0.5H or 0.2 H depending on the relative directions of the current in the coils. Coil P when isolated from coil Q, has a self inductance of 0.2 H. Calculate :

i) The mutual inductance between the two coils

ii) The self inductance of coil Q.

iii) The coupling factor between the coils

iv) The two possible values of the induced emf in coil P, when the current is decreasing at 1000A/sec in the series circuit. 7

MODULE – III

5. a) Define phase difference. With neat waveforms, explain the concept of leading and lagging phase angle. Also define the term power factor. 6

b) In a star connected, three phase system, derive the relationship between line voltage and phase voltage, line current and phase current and the expression for total power consumed. 8

c) A series R-L circuit takes 10A and dissipates 1000W when connected to a supply of 250V, 50Hz. Calculate : 6

i) The impedance

ii) The effective resistance

iii) The reactance

iv) The inductance

v) The power factor.

Draw the vector diagram.

6. a) Derive the expression for instantaneous current and instantaneous power in an AC circuit containing capacitance only. Draw neat and labeled waveforms and phasor diagram. 8

b) A delta-connected load draws a current of 15A at a lagging power factor of 0.85 from a 400V, 50Hz, three-phase supply. Calculate :

i) Resistance and inductance of each phase

ii) Power consumed. 6

c) Graphically show the representation of a three phase system and explain the concept of phase sequence. 6

MODULE – IV

7. a) Briefly explain the following terms with respect to single phase transformer : 4

   i) Magnetic leakage

   ii) Copper loss

   iii) Voltage regulation

   iv) Efficiency.

   b) Describe, with the help of a neat sketch, the construction and principle of operation of attraction type moving iron instrument. 10

   c) A 200KVA, 3300/240V, 50Hz single phase transformer has 80 turns on the secondary winding. Assuming an ideal transformer, calculate :

   i) Primary and secondary currents on full load

   ii) The maximum value of flux

   iii) The number of primary turns. 6

8. a) With the help of a neat phasor diagram, explain the working of a single phase transformer on no-load. 7

   b) Describe the open circuit and short circuit tests on a single phase transformer. 7

   c) The measurement of power in a 3-phase, star-connected load was done using two-wattmeter method. The load supplied was 30KW at 0.7 power factor lagging. Find the readings of each wattmeter. For what power factor will one of the wattmeters read zero ? 6
