USN ☐☐☐☐☐☐☐☐☐☐

14ELE15/25

First/ Second Semester B.E. Degree Examination, June/July 2015
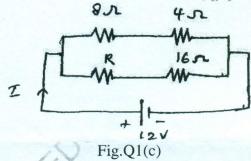## Basic Electrical Engineering

Time: 3 hrs.

Max. Marks:100

Note: *Answer any FIVE full questions,*
selecting ONE full question from each part.

PART – 1

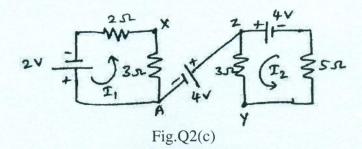1 a. State and explain Faraday's laws of electromagnetic induction. **(06 Marks)**

  b. An air cored solenoid has a length of 50 cm and a diameter of 2 cm. Calculate its inductances if it has 1000 turns and also find the energy stored in it, if the current rises from zero to 5A. **(06 Marks)**

  c. If the total power dissipated in the circuit shown is 18W, find the value of 'R' and its current. **(08 Marks)**

Fig.Q1(c)

2 a. State the following :
   i) Fleming's right hand rule
   ii) Fleming's left hand rule. **(06 Marks)**

  b. A closed iron ring of mean diameter 12 cm is made from round iron bar of diameter 2 cm. It has a uniform winding of 1000 turns. Calculate the current required to produce a flux density of 1.5 wb/m^2 given that relative permeability is 1250. Hence calculate the self inductance. **(08 Marks)**

  c. What is the potential difference between the point x and y in the network shown? **(06 Marks)**

Fig.Q2(c)

PART – 2

3 a. Explain the characteristics of DC series motor with a neat diagram. **(06 Marks)**

  b. Explain the significance of back emf in DC motor. **(05 Marks)**

  c. 4 pole DC shunt motor takes 22.5A from a 250V supply, $R_a = 0.5\Omega$ and $R_{sh} = 125\Omega$. The armature is wave wound with 300 conductors. If the flux per pole is 0.02wb. Calculate :
   i) speed
   ii) torque developed
   iii) power developed. **(09 Marks)**

4 a. With a neat diagram, explain the construction and working of dynamo-meter type wattmeter.
   (06 Marks)

   b. A 4 pole generator with wave wound armature has 51 slots, each having 24 conductors. The flux per pole is 0.01 wb. At what speed must the armature rotate to give an induced emf of 220V? What will be the voltage developed if the winding is lap and the armature rotates at the same speed. **(10 Marks)**

   c. Explain with a diagram, the construction features of various parts of a DC generator. **(04 Marks)**

PART – 3

5 a. What is meant by power factor in AC circuit? What is its significance in AC circuits?
   (06 Marks)

   b. Draw and explain the wiring diagram for the 3 – way control of lamp. **(06 Marks)**

   c. A series circuit with resistance of 10 Ω, inductance of 0.2H and capacitance of 40 μF is supplied with a 100 V supply at 50 Hz. Find the current, power and power factor of the circuit. **(08 Marks)**

6 a. State form factor of an alternating quantity. Derive the expression for it. **(08 Marks)**

   b. *Show that the average power consumed in a pure capacitance is zero. Draw the neat* waveform for voltage, current, power. **(06 Marks)**

   c. With a neat diagram, explain pipe earthing. **(06 Marks)**

PART – 4

7 a. With the usual notation, derive the expression for EMF equation of an alternator. **(06 Marks)**

   b. Establish the relationship between phase and line values of voltage and currents in 3 phase delta connected circuit. Show the phasor diagram neatly. **(06 Marks)**

   c. A balanced star connected load of $(8+6j)$ Ω/phase is connected to 3 phase, 230V supply. Find the line current, power factor, power reactive volt-ampere and total volt-ampere. **(08 Marks)**

8 a. Show that the power in a balanced 3 – phase circuit can be measured by 2 wattmeters. Draw the circuit and vector diagram. **(08 Marks)**

   b. Explain the generation of 3 – phase AC voltage. **(04 Marks)**

   c. A 3 – phase, 50 Hz, 16 pole generator with star connected winding has 144 slots with conductor /slot is 10. The flux per pole is 24.8 m wb is sinusiodally distributed. The coils are full pitched. Find : i) speed ii) the line emf. **(08 Marks)**

PART – 5

9 a. Explain the construction and working principle of a transformer with a neat sketch. **(08 Marks)**

   b. Explain the concept of rotating magnetic field in a 3φ induction motor. **(06 Marks)**

   c. The frequency of the emf in the stator of a 4 pole induction motor is 50 Hz and in the rotor is 1.5 Hz. What is the slip and at what speed is the motor running? **(06 Marks)**

10 a. What is 'slip' in an induction motor? Explain why slip is never zero in an induction motor. **(06 Marks)**

   b. A single phase transformer has 400 turns primary and 1000 secondary turns. The net cross – sectional area of the core is 60 cm^2. The primary winding is connected to a 500V, 50 Hz supply. Find :
   i) Peak value of flux density
   ii) emf induced in the secondary winding. **(06 Marks)**

   c. The maximum efficiency at full load and unity p.f. of a single phase 25 KVA, 500/1000V, 50Hz transformer is 98%. Determine its efficiency at
   i) 75% load, 0.9 p.f. and
   ii) 50% load, 0.8 p.f. **(08 Marks)**

* * * * *