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**First/Second Semester B.E. Degree Examination, June/July 2018**  
**Basic Electrical Engineering**

Time: 3 hrs.

Max. Marks: 100

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

**Module – 1**

- 1 a. State and explain Kirchoff's laws. (06 Marks)
  - b. A resistor of  $2.6 \Omega$  is connected in series with a parallel combination of  $4 \Omega$  and  $6 \Omega$  resistors. If the power consumed in  $4 \Omega$  resistor is 36 watts, find :
    - (i) Voltage across different resistors. (08 Marks)
    - (ii) Source voltage. (06 Marks)
    - (iii) Source current.
  - c. Compare and contrast electric and magnetic circuits. (06 Marks)
- 2 a. For the circuit shown in Fig. Q2 (a), find
    - (i) Current supplied by each battery. (07 Marks)
    - (ii) Total current supplied to  $10 \Omega$  resistor.
    - (iii) Total energy delivered to  $10 \Omega$  resistor, when the circuit is in ON condition for 4 hours.

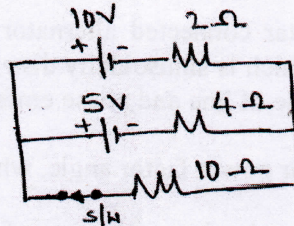


Fig. Q2 (a)

- b. Obtain an expression for energy stored in an inductor. (05 Marks)
- c. Two coils X of 12,000 turns and Y of 15,000 turns, lie in parallel planes such that 45% of the flux produced by coil X links coil Y. A current of 5 A in X produces 0.05 wb while the same current in Y produces 0.075 wb. Calculate
  - (i) The mutual inductance (ii) The coupling coefficient (08 Marks)
  - (iii) The percentage of flux produced by coil Y linking coil X.

**Module – 2**

- 3 a. Give a brief classification of dc generators with equivalent circuits. (06 Marks)
  - b. A 200 V, 4 pole, lap wound dc shunt motor has 800 armature conductors. The resistances of the armature and shunt field windings are  $0.5 \Omega$  and  $200 \Omega$  respectively. The motor takes a current of 21A and the flux produced per pole is 30 MWb. Find the speed and gross torque. There is brush contact drop of 1 volt across each brush. (08 Marks)
  - c. Explain with a neat diagram, the construction and working principle of dynamometer type wattmeter. (06 Marks)
- 4 a. With usual notations, deduce an expression for emf induced in a dc generator. (06 Marks)
  - b. What is back emf in a dc motor? What is its significance? (04 Marks)
  - c. Explain, why a series motor should not be started without load over it? (04 Marks)
  - d. With a neat diagram, explain the construction and working of induction type energy meter. (06 Marks)

**Module – 3**

- 5 a. Explain the following terms:  
 (i) Peak value (ii) Frequency  
 (iii) RMS value with respect to an alternating quantity. (06 Marks)
- b. Draw the vector diagram of RLC series circuit when:  
 (i) Inductive reactance exceeds capacitive reactance.  
 (ii) Capacitive reactance exceeds inductive reactance.  
 (iii) Both inductive and capacitive reactances are equal. (06 Marks)
- c. With neat diagram, explain control of a lamp from three different locations. (05 Marks)
- d. What precautions should be taken against electric shock? (03 Marks)
- 6 a. Prove that current in a pure inductive circuit lags behind the applied voltage by  $90^\circ$ . Also draw the power curves. (07 Marks)
- b. A circuit draws a current of  $(4+j3)$ A from a  $(180+j160)$  volt source. Find the circuit elements, if the supply frequency is 50 Hz. (07 Marks)
- c. Write notes on: (i) Miniature Circuit Breaker (MCB)  
 (ii) Earth Leakage Circuit Breaker (ELCB). (06 Marks)

**Module – 4**

- 7 a. What are the advantages of three phase over single phase system? (05 Marks)
- b. Obtain relation between line and phase values of currents in three phase delta system. (07 Marks)
- c. A 12 pole, 500 rpm star connected alternator has 60 slots with 20 conductors/slot. The flux /pole is 0.02 wb which is sinusoidally distributed. The winding factor is 0.97. Calculate frequency and magnitude of line and phase emfs. (08 Marks)
- 8 a. Obtain an expression for power factor angle, when power is measured using two wattmeters. (07 Marks)
- b. Three similar coils each having resistance of  $10 \Omega$  and inductive reactance of  $8 \Omega$  are connected in STAR across 400 V, 3 phase supply. Determine (i) Line current (ii) Phase current (iii) Total power and readings of each wattmeter connected to measure power. (07 Marks)
- c. Explain different types of rotors in synchronous generators. (06 Marks)

**Module – 5**

- 9 a. Show that iron losses and copper losses are equal for maximum efficiency in a transformer. (06 Marks)
- b. A 250 KVA, 1 phase transformer has an efficiency of 98.135% at full load 0.8 lagging power factor. The efficiency was found to be 97.751% at half-full load 0.9 pf. Calculate iron and copper losses. (08 Marks)
- c. Explain the working principle of a 3 phase induction motor. (06 Marks)
- 10 a. Obtain emf equation of transformer. (06 Marks)
- b. Write about various losses that occur in a transformer. (06 Marks)
- c. A four pole, 3 phase induction motor is supplied by 50 Hz AC supply. Find (i) Synchronous speed (ii) Motor speed and (iii) Frequency of rotor induced currents if the slip is 4%. (08 Marks)

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