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10ELE15

First Semester B.E. Degree Examination, January 2011

Basic Electrical Engineering

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FIVE full questions, choosing at least two from each part.  
 2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.  
 3. Answer to objective type questions on sheets other than OMR will not be valued.

PART - A

- 1 a. Choose your answers for the following :
- i) Which of the following statements is true both for a series and a parallel circuit?
    - A) resistances are additive
    - B) currents are additive
    - C) voltage drops are additive
    - D) powers are additive
  - ii) The resistance of a 200 W, 250 V lamp is \_\_\_\_\_.
    - A) 615  $\Omega$
    - B) 1250  $\Omega$
    - C) 31.25  $\Omega$
    - D) 312.5  $\Omega$
  - iii) The direction of induced emf in a conductor is given by \_\_\_\_\_.
    - A) Fleming's left hand rule
    - B) Fleming's right hand rule
    - C) Lenz's law
    - D) Cork screw rule
  - iv) The maximum value of co-efficient of coupling is \_\_\_\_\_.
    - A) 100%
    - B) more than 100%
    - C) 90%
    - D) none of these

(04 Marks)
- b. A 8 ohm resistor is in series with a parallel combination of two resistors 12 ohm and 6 ohm. The current in the 6 ohm resistor is 5 A. Determine the total power dissipated in the circuit. (05 Marks)
- c. State and explain Kirchoff's laws. (06 Marks)
- d. A coil of resistance 150 ohm is placed in a magnetic field of 0.1 milli Wb. The coil has 500 turns and a galvanometer of 450 ohm is connected in series with it. The coil is moved in 0.1 sec from the given field to another field of 0.3 milli Wb. Find the average induced emf and the average current through the coil. (05 Marks)
- 2 a. Choose your answers for the following :
- i) An A.C. voltage is given by  $100 \sin 314 t$ . The frequency is \_\_\_\_\_.
    - A) 50 Hz
    - B) 75 Hz
    - C) 25 Hz
    - D) 100 Hz
  - ii) The peak value of a sine wave is 400 V, its average value is \_\_\_\_\_.
    - A) 254.8 V
    - B) 282.6 V
    - C) 400 V
    - D) 565 V
  - iii) Inductive reactance of a coil of inductance 0.6 H at 50 Hz is \_\_\_\_\_.
    - A) 18.5  $\Omega$
    - B) 25  $\Omega$
    - C) 50  $\Omega$
    - D) 188.5  $\Omega$
  - iv) The power factor of a pure resistive circuit is \_\_\_\_\_.
    - A) zero
    - B) unity
    - C) lagging
    - D) leading

(04 Marks)
- b. In A.C. circuit, define : i) Amplitude ii) Frequency  
 iii) Form factor iv) Power factor (04 Marks)
- c. A circuit consists of resistance 10 ohm, an inductance of 16 mH and a capacitance of 150  $\mu$ F connected in series. A supply of 100 V at 50 Hz is given to the circuit. Find the current, power factor and power consumed by the circuit. (06 Marks)

Important Note : 1. On completing your answers compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 2 d. A parallel circuit comprises of a resistor of 20 ohm in series with an inductive reactance of 15 ohm in one branch and a resistor of 30 ohm in series with a capacitive reactance of 20 ohm in the other branch. Determine the current and power dissipated in each branch of the circuit if the total current drawn by the parallel circuit is  $10\angle -30^\circ$  Amps. (06 Marks)
- 3 a. Choose your answers for the following :
- In a 3-phase system, the emfs are \_\_\_\_\_.  
A)  $30^\circ$  apart      B)  $60^\circ$  apart      C)  $90^\circ$  apart      D)  $120^\circ$  apart
  - The power taken by a 3-phase load is given by the expression \_\_\_\_\_.  
A)  $3 V_L I_L \cos \phi$       B)  $\sqrt{3} V_L I_L \cos \phi$       C)  $3 V_L I_L \sin \phi$       D)  $\sqrt{3} V_L I_L \sin \phi$
  - In a 3-phase balanced delta system, the relation between the line voltage  $V_L$  and the phase voltage  $V_{ph}$  is \_\_\_\_\_.  
A)  $V_L = \frac{V_{ph}}{\sqrt{3}}$       B)  $V_L = \sqrt{3} V_{ph}$       C)  $V_L = V_{ph}$       D) none of these
  - When the two wattmeters used to measure a three-phase power, give equal readings, then the power factor of the circuit is \_\_\_\_\_.  
A) 0.5      B) 0      C) 0.866      D) 1 (04 Marks)
- b. Obtain the relationship between the phase and line values of voltages and currents in a balanced star connected system. (08 Marks)
- c. A balanced three phase star connected system draws power from 440 V supply. The two wattmeters connected indicate  $W_1 = 5$  KW and  $W_2 = 1.2$  KW. Calculate power, power factor and current in the circuit. (08 Marks)
- 4 a. Choose your answers for the following :
- The dynamometer type wattmeter is used to measure \_\_\_\_\_.  
A) only D.C. power      B) only A.C. power  
C) both A.C. and D.C. power      D) both active and reactive power
  - In the energy meter, constant speed of rotation of the disc is provided by \_\_\_\_\_.  
A) shunt magnet      B) series magnet      C) braking magnet      D) none of these
  - A fuse is a \_\_\_\_\_.  
A) current limiting device      B) protective device  
C) voltage limiting device      D) none of these
  - A good earthing should provide \_\_\_\_\_ resistance in earthing path.  
A) low      B) high      C) medium      D) none of these (04 Marks)
- b. With a neat diagram, explain the working of dynamometer type wattmeter. (08 Marks)
- c. What is the necessity of earthing? With a neat diagram, explain the pipe earthing. (08 Marks)

## PART - B

- 5 a. Choose your answers for the following :
- The emf generated by a given D.C. generator depends upon \_\_\_\_\_.  
A) flux only      B) speed only  
C) flux and speed      D) terminal voltage
  - For a 'P' pole lap wound armature of D.C. machine, the number of parallel paths are equal to \_\_\_\_\_.  
A) 2      B) 2P      C) P      D) P/2

- 5 a. iii) A commutator is made up of \_\_\_\_\_.  
 A) iron lamination B) copper segments  
 C) both iron and copper segments D) none of these
- iv) The function of a starter in a D.C. motor is to \_\_\_\_\_.  
 A) control it's speed B) increase it's starting torque  
 C) limit the starting current to safe value D) none of these (04 Marks)
- b. A 4 pole, 1500 rpm d.c. generator has a lap wound armature having 24 slots with 10 conductors per slot. If the flux per pole is 0.04 Wb, calculate the emf generated in the armature. What would be the generated emf if the winding is wave connected? (06 Marks)
- c. What is back emf in a D.C. motor? What is its significance? (05 Marks)
- d. Derive an expression for armature torque in a D.C. motor. (05 Marks)
- 6 a. Choose your answers for the following :
- i) The core of the transformer is laminated to reduce \_\_\_\_\_.  
 A) eddy current loss B) hysteresis loss C) copper loss D) friction loss
- ii) The copper loss of a certain transformer at half full load is 200 W. Then the copper loss at full load will be \_\_\_\_\_.  
 A) 100 W B) 200 W C) 400 W D) 800 W
- iii) Losses which do not occur in a transformer are \_\_\_\_\_.  
 A) copper losses B) magnetic losses C) friction losses D) none of these
- iv) A transformer steps up the voltage by a factor of 100. The ratio of current in the primary to that in the secondary is \_\_\_\_\_.  
 A) 1 B) 100 C) 0.01 D) 0.1 (04 Marks)
- b. What are the losses occurring in a transformer? How do they vary with load? How they can be minimized? (08 Marks)
- c. Define the voltage regulation of a transformer. What is its importance? (04 Marks)
- d. A 40 KVA single phase transformer has core loss of 450 W and full load copper loss of 850 W. If the power factor of the load is 0.8, calculate :
- i) Full load efficiency  
 ii) Load corresponding to maximum efficiency  
 iii) Maximum efficiency at unity power factor. (04 Marks)
- a. Choose your answers for the following :
- i) A salient pole field construction is used for alternator having \_\_\_\_\_.  
 A) low and medium speed B) large speed  
 C) very large speed D) none of these
- ii) A 4 pole, 1200 rpm alternator generates emf at a frequency of \_\_\_\_\_.  
 A) 25 Hz B) 40 Hz C) 50 Hz D) 60 Hz
- iii) For full pitch coil, the pitch factor  $K_p$  is \_\_\_\_\_.  
 A) 1 B) greater than 1 C) less than 1 D) none of these
- iv) The number of cycles generated in a 4 pole alternator in one revolution is \_\_\_\_\_.  
 A) 2 B) 4 C) 6 D) 50 (04 Marks)
- b. With neat diagram, explain the constructional features of a 3-phase alternator. (08 Marks)
- c. A 6 pole, 3-phase star connected alternator has 90 slots and 8 conductors per slot and rotates at 1000 rpm. The flux per pole is 50 milli wb. Find the induced emf across its line. Take  $K_d = 0.97$  and  $K_C = 0.96$ . (08 Marks)

