

**First/Second Semester B.E. Degree Examination, June 2012**

**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) The current in 5 ohm resistor is

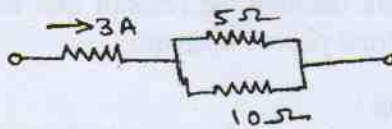


Fig.Q1(a)(i)

- A) 2A  
 B) 3A  
 C) 1A  
 D) 1.5A

- ii) The total resistance of parallel circuit is

- A) less than the smallest resistance  
 B) more than the smallest resistance  
 C) more than the highest resistance  
 D) none of these

- iii) Inductance opposes \_\_\_\_\_ in current in a circuit.

- A) only increase  
 B) only decrease  
 C) change  
 D) none of these

- iv) If coefficient of coupling between two coils is increased, mutual inductance between the coils \_\_\_\_\_.

- A) is increased  
 B) is decreased  
 C) remains unchanged  
 D) none of these

(04 Marks)

- b. List out advantages of parallel circuit over series circuit. List out characteristics of parallel circuit. (06 Marks)

- c. Deduce an expression for stored energy in a magnetic field. (04 Marks)

- d. Find current in the battery, the current in each branch and p.d. across AB in the network shown in Fig.Q1(d). (06 Marks)

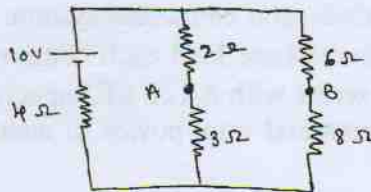


Fig.Q1(d)

- 2 a. Choose your answers for the following :

- i) A coil is rotating in the uniform field of a 10-pole generator. In one revolution of the coil, the number of cycles generated by voltage is \_\_\_\_\_.

- A) 10  
 B) 5  
 C) 2.5  
 D) 4

- ii) The average value of sine wave over a one complete cycle is

- A) zero  
 B) +1  
 C) -1  
 D)  $\frac{1}{2}$

- iii) The voltage of the applied source in the circuit of fig.Q2(a)(iii) is

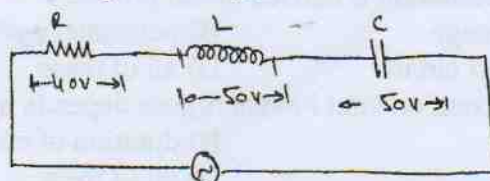


Fig.Q2(a)(iii)

- A) 50 V  
 B) 100 V  
 C) 40 V  
 D) 140 V

- 2 a iv) The power taken by the circuit shown is

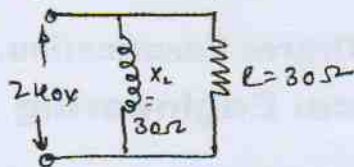


Fig. Q2(a)(iv)

- A) 480 W  
 B) 1920 W  
 C) 1200 W  
 D) none of these (04 Marks)

- b. With the help of circuit diagram and phasor diagram, find the phase angle, impedance and power in case of R-L series circuit. (08 Marks)
- c. An alternating current of frequency 60 Hz has a maximum value of 120 A.
- Write down equation for the instantaneous value.
  - Reckoning time from the instant the current is zero and becoming positive, find the instantaneous value after  $1/360$  sec.
  - Time taken to reach 96 A for the first time. (04 Marks)
- d. A  $60 \Omega$  resistor is connected in parallel with an inductive reactance of  $80 \Omega$  to a 240 V, 50 Hz supply. Calculate: i) The current through the resistor and inductance, ii) The supply current, iii) The circuit phase angle. Draw phasor diagram. (04 Marks)
- 3 a. Choose your answers for the following :
- Three inductive coils each having an impedance of  $17.7 \Omega$  are connected in star. The circuit is fed from a 3-phase, 400 V, 50 Hz supply. The current (line) drawn by the circuit is equal to  
 A) 22.6 A      B) 39.14 A      C) 13 A      D) none of these
  - For a 3-phase star connected balanced circuit having inductive load, the angle between the line currents and corresponding line voltages is equal to  
 A)  $30^\circ$       B)  $30^\circ - \phi$       C)  $30^\circ + \phi$       D)  $\phi$
  - When two wattmeters are connected in a 3-phase circuit to measure its total power consumption, one of the wattmeter would read zero, when the load power factor is,  
 A) 0.2 lagging      B) unity      C) 0.5 lagging      D) zero
  - Active power drawn by a 3-phase balanced load is given by  
 A)  $P = V_L I_L \cos \phi$       B)  $P = \sqrt{3} V_L I_L$   
 C)  $P = \sqrt{3} V_L I_L \cos \phi$       D)  $P = \sqrt{3} V_{ph} I_{ph} \cos \phi$  (04 Marks)
- b. With the aid of a phasor diagram obtain the relationship between the line and phase values of voltages in a three-phase, star connected system. (08 Marks)
- c. The three arms of a three-phase load each comprise an inductor of resistance  $25 \Omega$  and of inductance  $0.15$  H in series with a  $120 \mu\text{F}$  capacitor. The supply voltage is 415 V, 50 Hz. Calculate the line current and total power in watts, when the three arms are connected in delta. (08 Marks)
- 4 a. Choose your answers for the following :
- The type of wattmeter commonly used for measurement of power in ac circuit is  
 A) rectifier type      B) dynamometer type  
 C) moving iron type      D) thermo-couple type
  - In energy meter, constant speed of rotation of disc is provided by  
 A) shunt magnet      B) series magnet  
 C) braking magnet      D) none of these
  - Earthing of electrical installation is carried out to protect  
 A) equipments from damage      B) personnel against electric shock  
 C) equipments from short circuit      D) all of these
  - The effect of electric current on vital human organs depends upon  
 A) magnitude of current      B) duration of current  
 C) frequency of current      D) all of these (04 Marks)



- 7 a. ii) In modern alternators, the rotating part is  
 A) field B) armature  
 C) field and armature D) none of these
- iii) An alternator has a phase sequence of RYB for its phase voltage. In case the direction of rotation of alternator is reversed, the phase sequence will become  
 A) RBY B) RYB  
 C) YRB D) none of these
- iv) Alternators have short-pitched winding so as to  
 A) increase machine rating B) improve the voltage waveform  
 C) improve generated voltage D) none of these (04 Marks)
- b. Explain the essential difference between cylindrical and salient pole rotors. (04 Marks)
- c. Derive e.m.f equation of an alternator. (06 Marks)
- d. A 3-phase, 6-pole, star connected alternator revolves at 1000 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.05 wb. Calculate voltage generated, if  $K_w = 0.96$ . (06 Marks)
- 8 a. Choose your answers for the following :
- i) The speed at which the rotating magnetic field produced by stator currents rotates is  
 A) synchronous speed B) rotor speed  
 C) greater than synchronous speed D) none of these
- ii) When an induction motor is at standstill its slip is  
 A) zero B) 0.5 C) 1 D) infinity
- iii) If  $N_s$  is synchronous speed and 's' is the slip, then the actual running speed of an induction motor will be  
 A)  $N_s$  B)  $sN_s$  C)  $(1 - s)N_s$  D)  $(N_s - 1)s$
- iv) Initial starting current drawn by a 3-phase induction motor in terms of full load current on application of rated voltage (approximately) is:  
 A) equal to full load current B) 2 times  
 C) more than 10 times D) 5 times (appx) (04 Marks)
- b. Explain the principle of operation of a 3-phase induction motor. (06 Marks)
- c. Deduce an expression for the frequency of rotor current in an induction motor. (04 Marks)
- d. A 3-phase, 6-pole, 50 Hz induction motor has a slip of 1% at no load, and 3% at full load. Determine: i) synchronous speed, ii) no-load speed, iii) full load speed, iv) frequency of rotor at stand still, v) frequency of rotor current at full load. (06 Marks)

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