

First/Second Semester B.E. Degree Examination, December 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 in 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 correct answer for the following :
- One kWh of electrical energy is equal to
 A) 36×10^3 Joules B) 36×10^5 Joules C) 36×10^6 Joules D) None of these
 - If resistance of a 700m long cable is 100 ohms, then the resistance of 8km of similar cable is
 A) 100 Ω B) 2186 Ω C) 8000 Ω D) 1143 Ω
 - When resistances R_1, R_2, R_3 are connected in parallel such that $R_1 > R_2$ and $R_2 < R_3$, the total resistance of the network is always
 A) more than R_2 B) more than R_3 C) less than R_2 D) less than R_1
 - When all the flux due to current in one coil links with the other coil, the mutual inductance between coils is given by
 A) $M = \sqrt{L_1 L_2}$ B) $M = K\sqrt{L_1 L_2}$ C) $M = L_1 L_2$ D) $M = L_1 L_2 / 2$
 (04 Marks)
- b. Define self and mutual inductance. (04 Marks)
- c. A lamp bulb is connected to a source through a switch. It is found that the light output is insufficient and it is decided to add a second lamp, to give more light. Give the appropriate lamp connection. Justify your answer. (04 Marks)
- d. Two storage batteries A and B are connected to supply a load of 0.3 Ω . The open circuit emf of battery A is 11.7 V and that of B is 12.3 V. The internal resistances are 0.06 Ω and 0.05 Ω respectively. Determine the current supplied to the load. (08 Marks)
- 2 a. Choose your correct answer for the following :
- A choke coil of inductance 0.03 H when connected across 100V supply draws 10 $\angle -90^\circ$ A. The frequency of supply is
 A) 53 Hz B) 43 Hz C) 63 Hz D) 60 Hz
 - The power factor of a load can be improved by
 A) Inductor B) Capacitor
 C) Both inductor and capacitor D) None of these
 - In a circuit $I_{ph} = 10 \angle -30^\circ$ A, $V_{ph} = 100 \angle 45^\circ$ V. The power factor of the circuit is
 A) 0.13 B) 0.26 C) 0.39 D) 0.52
 - An R – L – C series circuit is said to be in electrical resonance when
 A) $X_L > X_C$ B) $X_L < X_C$ C) $X_L = X_C$ D) All of these
 (04 Marks)
- b. A series R – L – C circuit having $R = 100 \Omega$, $L = 0.15$ H, $C = 25 \mu\text{F}$ draws a current of 1.96 A from 60 Hz supply. Determine the supply voltage using i) Ohm's law ; ii) Kirchoff's law. (08 Marks)
- c. A coil having resistance of R ohms and inductance of L henry is connected across a variable frequency alternating current supply of 110V. An ammeter in the circuit showed 15.6 A when frequency was 80 Hz and 19.7 A when frequency was 40 Hz. Find the values of R and L. (08 Marks)

- 3 a. Choose your correct answer for the following :
- The total power consumed by a 3 phase balanced load is given by
 A) $W_1 - W_2$ B) $\frac{W_1 + W_2}{2}$ C) $\sqrt{3}(W_1 - W_2)$ D) None of these
 where W_1 and W_2 are wattmeter readings
 - Electrical displacement between different phases in a six phase system is
 A) 60° B) 120° C) 240° D) None of these
 - The frequencies of 3 phase voltage in a three phase balanced system are
 A) Different B) Same C) Zero D) Infinity
 - Fig.Q.3(a)(iv) represents
 A) Unbalanced star connected supply.
 B) Balanced star connected load.
 C) Balanced star connected supply.
 D) Unbalanced star connected load.

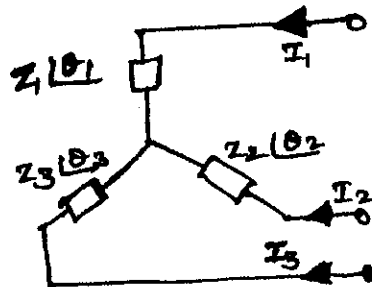


Fig.Q.3(a)(iv)

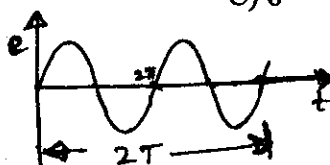
(04 Marks)

- Define the three phase system. Draw the waveform and phasor diagram. Mention four advantages of 3 phase systems over single phase systems. (08 Marks)
 - An a – c generator is supplying a load of 300 kW at a power factor of 0.6 lagging. If the power factor is raised to unity, how much more power (in kilowatts) can the generator supply, for the same kilowatt – ampere loading? (03 Marks)
 - A balanced three phase star connected load draws power from a 440 V supply. The two wattmeters connected indicate $W_1 = 4.2$ kW, $W_2 = 0.8$ kW. Calculate the power factor and line current. (05 Marks)
- 4 a. Choose your correct answer for the following :
- In the electricity bill, the number of units consumed represents
 A) kW consumed B) Wh consumed
 C) kWh consumed D) Watts consumed
 - Dynamometer wattmeter is basically a
 A) Integrating instrument B) Indicating instrument
 C) Digital instrument D) Not an instrument
 - Induction type single phase energy meter can be used on
 A) AC only B) DC only C) both AC and DC D) None of these
 - Exact value of true quantity being measured can be obtained from measuring instruments by
 A) Cleaning the instrument frequently B) Making proper connections
 C) Proper maintenance D) Proper calibration. (04 Marks)
- With the help of a neat figure, explain the working of a single phase induction type energymeter. (08 Marks)
 - Discuss the basic principles of earthing. Draw a neat figure for pipe earthing, mentioning all the dimensions and materials used. (08 Marks)

PART – B

- 5 a. Choose your correct answer for the following :
- Magnetic field can be obtain by
 - Only a permanent magnet.
 - Only a current carrying conductor.
 - Both a permanent magnet and a current carrying conductor.
 - None of the above.
 - Flemings' left hand rule is applicable to
 - DC generator
 - Transformer
 - DC motor
 - Both A and C.
 - To match a motor to the load, it is necessary to know
 - Efficiency of the motor.
 - Torque/speed characteristics for the load.
 - Output of the motor
 - Load current.
 - In one revolution, a generator generates voltage as shown in Fig.Q.5(a)(iv). The number of poles of the generator is
 - 4
 - 2
 - 8
 - 6.

Fig.Q.5(a)(iv).



- Discuss the characteristics, of T_a/I_a and N/I_a for a series motor. (06 Marks)
- A 220 V DC short shunt compound motor takes a current of 20 A. Determine the back emf induced, given $R_{sh} = 100 \Omega$, $R_{se} = 0.2 \Omega$, $R_a = 0.1 \Omega$. (04 Marks)
- A 4 pole generator has 36 slots with 10 conductors/slot. The flux and speed are such that an average emf generated in each conductor is 1.7 volts. The current in each parallel path is 10A. Determine the total power generated when the armature winding is
 - lap connected ;
 - wave connected.
 (06 Marks)

- 6 a. Choose your correct answer for the following :
- Primary and secondary windings of a transformer are
 - electrically connected and magnetically linked.
 - electrically separated and magnetically separated.
 - electrically connected and magnetically separated.
 - electrically separated and magnetically linked.
 - Low voltage winding of a step down transformer is
 - Primary winding
 - Secondary winding
 - Neither primary nor secondary
 - Both primary and secondary winding.
 - Induced emf on secondary of a transformer is
 - Dynamically induced emf
 - Self induced emf
 - Mutually induced emf
 - None of these
 - Increase or decrease of voltage by the transformer depends on
 - Size of the transformer
 - Type of the transformer
 - Transformation ratio
 - All of these
- Discuss the magnetizing and demagnetizing effect in a transformer. (06 Marks)
 - Write briefly on the necessity of a transformer in power transmission and distribution. (04 Marks)
 - A 25 KVA, 2000/200V transformer has iron and copper losses of 350 W and 225 W respectively at $3/4^{\text{th}}$ full load. Determine the efficiency of the transformer at half full load, 0.8 p.f. What is the value of copper loss at maximum efficiency? (06 Marks)

- 7 a. Choose your correct answer for the following :
- The highest speed at which a 50 Hz AC generator can be operated is
A) 3000 rpm B) 1500 rpm C) 3600 rpm D) 1800 rpm
 - Turbo alternators have
A) large diameter and short axial length.
B) Small diameter and large axial length.
C) Small diameter and short axial length.
D) Large diameter and large axial length.
 - Frequency of supply in India is
A) 60 Hz B) 25 Hz C) 50 Hz D) 75 Hz.
 - Distribution factor in alternators is always
A) equal to one B) more than one C) zero D) less than one
(04 Marks)
- b. Derive the emf equation of an alternator. (06 Marks)
- c. A 100 KVA, 440V, Y connected, 3 phase, 50 Hz alternator is operating at a power factor of 0.8 lag. Its armature resistance / ph is 0.1Ω and field resistance is 30Ω . Mechanical and core losses are equal to 1500 W. At this load, the field current is 6.25 A. Determine the efficiency of the alternator. (10 Marks)
- 8 a. Choose your correct answer for the following :
- If ϕ_m is the maximum value of flux due to any one of the three phases in an induction motor, the resultant flux ϕ_r , at any instant, is
A) $\frac{5}{2}\phi_m$ B) $\frac{3}{2}\phi_m$ C) $\frac{2}{3}\phi_m$ D) $\frac{1}{2}\phi_m$
 - Compared to a slip ring induction motor, the starting torque of a squirrel cage induction motor is
A) Same B) High C) Very high D) Medium
 - Normal speed of a 3 phase, 4 pole, 400V, 50Hz induction motor can be
A) 1455 rpm B) 1550 rpm C) 1500 rpm D) 1050 rpm
 - Induction motor works at
A) Lagging power factor B) Leading power factor
C) UPF D) Zero power factor. (04 Marks)
- b. Why 3 phase induction motors are called asynchronous motors? Explain the principle of operation of a 3 phase induction motor. (04 Marks)
- c. With the help of neat figures of stator and rotors, explain the construction of a squirrel cage and a slip ring induction motor. (06 Marks)
- d. A 4 pole, 3 phase induction motor operates from a supply whose frequency is 50 Hz. Calculate :
- The speed at which the magnetic field of the stator is rotating.
 - The speed of the rotor when the slip is 0.04.
 - The frequency of the rotor currents when the slip is 0.03.
 - The frequency of the rotor currents at standstill, with the reason behind it. (06 Marks)

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