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10ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2017
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each Part.*

PART – A

1 a. Choose the correct answers for the following : **(04 Marks)**

i) As per ohms law
A) $V \alpha I$ B) $V \alpha R$ C) $I \alpha R$ D) $V = IR$

ii) Which of the following is true both for a series and parallel circuit
A) Resistances are additive B) Currents are additives
C) Voltage drops are additive D) Powers are additives

iii) Inductance opposes _____ in current in a circuit
A) Only increases B) Only decreases
C) Change D) None of these

iv) A wire of resistance R is stretched to doubled its length the new resistance of the wire is
A) R/2 B) 2R C) 4R D) R/4.

b. State and explain Kirchhoff's laws. **(06 Marks)**

c. Define co-efficient of coupling and obtain the relation between self inductances, mutual inductance and co-efficient of coupling. **(04 Marks)**

d. Two identical coils of 1200 turns each, are placed side by side such that, 60% of flux produced by one coil links the other. A current of 10A in the first coil, sets up a flux of 0.12 mwb. If the current in the first coil changes from +10A to – 10A in 20m sec.
Find : i) The self inductance of coils
ii) The EMF's induced in both coils. **(06 Marks)**

2 a. Choose the correct answers for the following : **(04 Marks)**

i) An AC voltage is given by 100 sin 314 t. The frequency is
A) 50 Hz B) 75 Hz C) 25 Hz D) 100 Hz

ii) An alternating current is given by $i = 20 \sin 314 t$ and the time taken to complete 10 cycles is _____
A) 0.02S B) 0.2S C) 2S D) 0.1S

iii) The phase difference between V and I for the series R–L circuit _____ as X_L increases
A) Decreases B) Remains constant
C) Increases D) None of these

iv) The voltage and current in AC circuit are given by $V = 50 \cos \omega t$ and $i = 5 \sin \omega t$. The power consumed by the circuits.
A) 0 Watts B) 250 Watts C) 100 Watts D) 50 Watts.

b. Define average and RMS value of all alternating current and find their relation with maximum value, if the alternating quality is sinusoidal. **(08 Marks)**

c. A circuit consists of a resistance of 10Ω, an inductance of 16mH and a capacitance of 150μF connected in series. A supply of 100V at 50Hz is given to the circuit. Find the current, power factor and power consumed by the circuit. Draw the vector diagram. **(08 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**

i) In a 3-phase system, the emf's are _____

A) 30° apart B) 60° apart C) 90° apart D) 120° apart

ii) When the two watt meters used to measure a 3-phase power, give equal readings then the power factor of the circuit is

A) 0.5 B) 0 C) 0.866 D) 1

iii) 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) $P = \sqrt{3}\, V_{Ph} I_{ph} \cos\phi$

iv) The resistance between any two terminals of a balanced delta connected load is 20Ω. A resistance of each phase is _____

A) 20Ω B) 30Ω C) 10Ω D) 60Ω

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. **(06 Marks)**

c. Show that two Watt meters are sufficient to measure 3ϕ power for balanced 3ϕ power system. **(06 Marks)**

d. Three coils each having a resistance of 10Ω and an inductance of 0.02H are connected in star across 440V, 50Hz, 3-phase supply. Calculate the line current and total power consumed. **(04 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**

i) The dyanometer type Watt meters is used to measure _____

A) Only DC power B) Only AC power

C) Both DC and AC power D) None of these

ii) The unit of electrical is equivalent

A) 3600 w – s B) 3.6 kw-s C) 1 KWH D) 100 WH

iii) The rotating disc of the energy meter is made of _____

A) Copper B) Aluminium C) Platinum D) Silver

iv) In an induction type energy meter, the breaking torque is directly proportional to _____

A) Deflecting torque B) Controlling torque C) Speed of the disc D) Damping torque.

b. With the help of a neat diagram, describe the constructional features and working of a dynamometer type Watt meter. **(06 Marks)**

c. Name different types of domestic wiring and explain any one type of wiring. **(04 Marks)**

d. What is the necessity of earthing? With a neat diagram, explain the pipe earthing. **(06 Marks)**

PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**

i) In a wave – winding, the number of parallel paths is equal to _____

A) P/2 B) 2 C) P D) 2P

ii) A 4-pole wave connected generator has a useful flux of 0.02. Weber and generates a voltage of 288 V at 1200 rpm the number of conductors in the armature are

A) 180 B) 360 C) 720 D) 90

iii) High voltage Dc generators uses _____ winding

A) Lap B) Wave C) Either A or B D) None of these

iv) A commutator is made up of _____

A) Iron B) Copper segments C) Both A and B D) None of these.

b. Derive an expression for armature torque in a DC motor. **(05 Marks)**

c. The field current in a DC shunt machine is 2A and the line current is 20A at 200V. Calculate: i) The generated EMF. When working as generator ii) Torque in N-m when running at 1500 rpm as motor. Take the armature resistance as 0.5Ω. **(06 Marks)**

d. What is back emf in a Dc motor? What is its significance? **(05 Marks)**

6 a. Choose the correct answers for the following : **(04 Marks)**

i) When the supply frequency of a transformer is doubled then the hysteresis loses
A) Remains same B) Doubled
C) Reduced by 50% D) Hysteresis is equal to Eddy current loss

ii) The losses which donot occur in transformer are _____
A) copper losses B) magnetic losses C) Friction losses D) none of these

iii) A transformer transfers electrical energy from primary to secondary usually with a change in
A) Frequency B) Power C) Voltage D) Time period

iv) The core of the transformer is laminated to reduce
A) Eddy current loss B) Hysteresis loss C) Copper loss D) Friction loss.

b. Derive an Emf equation of transformer. **(05 Marks)**

c. A 600 KVA transformer has a efficiency of 92% at full load, unity power factor and at half load, 0.9 power factor. Determine its efficiency at 75% of full load and 0.9 power factor. **(06 Marks)**

d. What are the various types of losses and how to overcome these losses in a transformer? **(05 Marks)**

7 a. Choose the correct answers for the following : **(04 Marks)**

i) The disadvantages of a short pitched coils in an alternator is that
A) Harmonics are introduced B) Waveform become non–sinusoidal
C) Voltage round the coil is reduced D) None of the above

ii) An 8-pole alternator runs at 600 rpm. The frequency of the induced Emf is _____
A) 40Hz B) 50Hz C) 60Hz D) 75Hz

iii) In an alternator, the number of slots per pole per phase is 4 and the slot angle is 15°. The distribution factor is _____
A) 0.945 B) 0.966 C) 0.956 D) 0.987

iv) An alternator generates a no load line voltage of 11 KV. The full load terminal voltage is 10.6KV. The voltage regulation is.
A) 5% B) 6% C) 4% D) 3.77%.

b. Derive an expression for Emf equation of an alternator. What is the necessity of considering pitch factor and distribution factor for Emf equation? **(08 Marks)**

c. A 12 pole, 500rpm, star connected alternator has 60 slots, with 20 concoctors per slot. The flux per pole is 0.02 wb and is distributed sinusoidally. The winding factor is 0.97. Calculate: i) frequency ii) phase Emf iii) Line Emf. **(08 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**

i) When the rotor of 3ϕ induction motor is blocked, the slipis _____
A) 0 B) 0.5 C) 0.1 D) 1

ii) The direction of rotation of 3ϕ induction motor depends on _____
A) supply voltage B) Number of poles
C) The supply frequency D) The phase sequence of the supply

iii) A 4 pole, 50Hz induction motor has a slip of 4%. The frequency of the rotor current is _
A) 2.5Hz B) 2Hz C) 3Hz D) 4Hz

iv) Three phase wound rotor induction motors are also called as _____ motors
A) synchronous B) Series C) Commutator D) Slip ring.

b. Mention the advantages and disadvantages of squirrel cage and slip ring induction motors. **(03 Marks)**

c. Explain why a starter is required for a 3-ϕ induction motor. With a circuit diagram explain the working of a star-delta starter for a 3-ϕ induction motor. **(08 Marks)**

d. A 3-ϕ induction motor has 6 poles and runs at 940 rpm on full load. It is supplied from an alternator having 4 poles and running at 1500 rpm, Calculate the full load slip and the frequency of the rotor currents of the induction motor. **(05 Marks)**