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10ELE15/25

First/Second Semester B.E. Degree Examination, June / July 2014
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 the correct answers for the following : _____ (04 Marks)
- q' The resistance of a conductor is directly proportional to its _____ and inversely proportional to its _____
- A) Length & Area B) Area & Length
 C) Length & Current D) Length & Voltage
- ii) When the conductor moves perpendicular to the lines of flux, the emf induced is _____
- A) Minimum B) Maximum C) Zero D) None of these
- iii) The mutual inductance between two coils of self inductance 0.8 H and 0.2 H, have a coefficient of coupling 0.9 is _____
- A) 0.36 H B) 0.4 H C) 0.16 H D) 0.144 H •
- iv) An electric heater is rated to 2 kW, 200 V. The resistance of the heater coil is _____
- A) 10 Ω B) 0.1 Ω C) 20 Ω D) 200 Ω
- b. Show that the equivalent resistance of two resistors connected in parallel in the ratio of the product of these two resistances divided by the sum of those two resistance values. (04 Marks)
- c. Derive an expression for dynamically induced emf. (06 Marks)
- d. Two coils having 1000 turns and 1600 turns respectively are placed close to each other such that 60% of the flux produced by one coil. If a current of 10 A, flowing in the first coil, produces a flux of 0.5 mwb. Find the inductance of the second coil. (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- i) An alternating current is given by $i = 14.14 \sin(\omega t + \frac{\pi}{6})$ has an rms value of _____ ampereS.
- A) 10 A B) 14.14 C) 20 A D) 0.707
- ii) In an a.c circuit, the ratio of kW/KVA represents _____
- A) Power factor B) Load factor C) Form factor D) Peak factor
- iii) A current drawn by a capacitor of 20 μ F is 1.382 A from a 220 V A.C. supply. The supply frequency is _____
- A) 25 Hz B) 60 Hz C) 50 Hz D) 40 Hz
- iv) The unit of apparent power is _____
- A) kW B) KVAR C) KVA D) Joules
- b. Define: (i) Instantaneous value (ii) Amplitude (iii) Cycle (iv) Period with respect to sinusoidally varying quantities. (04 Marks)
- c. Two impedances $(150 - j157) \Omega$ and $(100 + j110) \Omega$ are connected in parallel across 200 V, 50 Hz supply. Find branch currents, total current and total power consumed in the circuit. Draw the phasor diagram. (06 Marks)
- d. Show that the power consumed in an R-C series circuit is $W_{\cos \phi}$. Draw the waveform for voltage, current and power. (06 Marks)

3 a. Choose the correct answer:

(04 Marks)

- The phase sequence of a three phase system is RYB. The other possible phase sequence is _____
 A) YRB B) BRY C) RBY D) None of these
- When the two wattmeters used to measure three phase power gives equal readings, then the p.f of the circuit is given by _____
 A) 0 B) 0.5 C) 1 D) 0.866
- The power consumed by a 3-4) load is given by the expression _____
 A) $3V_L I_L \cos\phi$ B) $V_a I_L \cos\phi$ C) $V_L I_L \cos\phi$ D) $\sqrt{3} V_L I_L \cos\phi$
- A 3-4) apparatus is _____ efficient than a 1 — 4) apparatus,
 A) More **B) Less** C) Both (A) & (B) D) None of these

What are the advantages of 3-4) systems over a single phase system?

(06 Marks)

- A 3. 4), 400 V, motor takes an input of 40 kW at 0.45 p.f. lag. Find the reading of each of the two single phase wattmeters connected to measure the input. (05 Marks)
- Obtain the relationship between line current and phase current in a balanced 3-4) delta connected system. (05 Marks)

4 a. Choose the correct answers for the following :

(04 Marks)

- The totating disc of the energy meter is made of _____
 A) Copper B) Silver C) Aluminum D) Platinum
 - One unit of electrical energy is equivalent to _____
 A) 3.6 kW.s B) 3600 W.S C) 1 kWh D) 10 WH
 - An intermediate switch is used in _____ of lamps.
 A) Three way control B) Two way control
 C) One way control D) Four way control
 - The value of "Fusing Factor" is always _____
 A) Less than 1 B) Equal to 1 C) Zero D) More than 1.
- With the help of neat diagram, explain the construction and principle of operation of a single phase induction type energy meter. (08 Marks)
 - Write the circuit diagram and switching table for two-way and three-way control of lamp. Where is it used? (08 Marks)

PART — B

5 a. Choose the correct answers for the following :

(04 Marks)

- The purpose of commutator in a d.c. generator is to _____
 A) Increase output voltage B) Convert emf from AC to DC
 C) Reduce sparking at brushes D) Increase the speed
 - In a lap winding, the number of parallel paths is equal to _____
 A) $\frac{P}{2}$ B) 2P C) P D) 4P
 - The speed of a d.c _____ motor is almost constant.
 A) Shunt B) Series C) Compound D) None of these
 - The torque produced by DC motor is directly proportional to _____
 A) $V I_a$ B) $I_a R_a$ C) I_d D) $E_b I_a$
- Derive the expression for the e.m.f of a DC generator. (04 Marks)
 - Sketch the various characteristics of DC shunt motor and mention its applications. (06 Marks)
 - A DC shunt motor takes an armature current of 110 A at 480 V. The armature resistance is 0.2 Ω . The machine has 6 poles and armature is lap connected with 864 conductors. The flux per pole is 0.05 Wb. Calculate i) speed ii) the torque developed by the armature. (06 Marks)

6 a. Choose the correct answers —

- i) The transformation ratio in a transformer is equal to _____
 A) $\frac{I}{E_2}$ B) $\frac{N_1}{N_2}$ C) $\frac{N_2}{N_1}$ D) $\frac{12}{1}$
- ii) The efficiency of a transformer is maximum when _____
 A) Iron loss is more than copper loss B) Iron loss is equal to copper loss
 C) Iron loss is less than copper loss D) None of these
- iii) Core type of transformers are used to handle _____ and _____ voltages.
 A) Low and High B) Low and Medium C) High and Medium D) None of these
- iv) Copper loss in a transformer is a _____ loss.
 A) Constant loss B) Variable loss C) Friction loss D) None of these

b. Explain the construction and working of a transformer. (06 Marks)

c. Find the number of turns on the primary and secondary side of a 440/230 V, 50 Hz single phase transformer, if the net area of cross section of the core is 30 cm^2 and the maximum flux density is 1 Wb/m^2 . (04 Marks)

d. A single phase transformer working at 0.8 pf has an efficiency 94% at both three fourth full load and full load-of 600 kW. Determine the efficiency at half full —load, unity power factor. (06 Marks)

7 a. Choose the correct answers for the following :

(04 Marks)

- i) A non salient pole rotor is used in _____ alternator.
 A) Low speed B) High speed C) Medium speed D) A and B
- ii) The speed at which a 4—pole alternator has to be driven to generate a voltage at 50 Hz is _____
 A) 1000 rpm B) 1500 rpm C) 2000 rpm D) 1440 rpm
- iii) The E. M. F. induced in an alternator is given by the equation _____
 A) $4.44 f \phi k_p k_d$ B) $2.22 k_p \phi z$ C) $2.22 f z k_p k_d$ D) $4.44 f z$
- iv) The field winding of an alternator is _____ excited.
 A) DC B) AC C) Both DC and AC D) None of these
- b. How are alternators classified? With a neat diagram, show the difference between them. (08 Marks)
- c. A 2 — pole, 3 — phase alternator running at 3000 rpm has armature slots with 2 conductors in each slot. Calculate the flux per pole required to generate a line voltage of 2300 V. Distribution factor is 0.952 and pitch factor is 0.956. (06 Marks)
- d. Define regulation of an alternator. (02 Marks)

8 a. Choose the correct answers for the following :

(04 Marks)

- i) The frequency of the rotor current is _____
 A) X. B) sf C) sf^2 D) None of these
- ii) In a 3 — phase induction motor, the slip speed is given by _____
 A) N_s B) N C) $N_s - N$ D) $N - N_s$
- iii) The synchronous speed of three phase induction motor is given by _____
 A) $N_s = \frac{120f}{p}$ B) $N_s = 120 f p$ C) $\frac{120P}{f} - N_s$ D) $N_s \frac{Pf}{120}$
- iv) A 3 — (I) induction motor having 4 — poles, 50 Hz runs at 1440 rpm, the slip is _____
 A) 3% B) 5% C) 4% D) 1%
- b. With a neat diagram, explain the working principle of 3 - induction motor. (06 Marks)
- c. A 10 pole induction motor is supplied by a 6 — pole alternator which is driven at 1200 rpm. If the motor runs with a slip of 3%, what is its speed? (06 Marks)
- d. Why does an induction motor need a starter? (04 Marks)