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10ELE15/25

First/Second Semester B.E. Degree Examination, January 2013
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.***

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.

PART – A

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

i) The Ohm's law can not be applied to
A) Resistance B) Inductance C) Capacitance D) Diode

ii) The practical unit of electrical energy is
A) kWh B) Wh C) Watt - second D) Joule second

iii) The self inductance 'L' is given by
A) $N\phi I$ B) NI/ϕ C) $N\phi/I$ D) $I/N\phi$

iv) A current of 20 A is reversed in 0.1 sec through an inductance of 1 H, thus emf induced is ___ volts.
A) 200 B) - 200 C) - 600 D) +400

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

c. Obtain an equation for the energy stored in a magnetic field. **(04 Marks)**

d. A circuit consists of two parallel resistors having resistance of 20 Ω and 30 Ω respectively., connected in series with 15 Ω. If current through 15Ω resistor is 3A, find (i) current in 20Ω & 30Ω resistors, (ii) voltage across the whole circuit, (iii) the total power and power consumed in all resistances. **(06 Marks)**

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

i) The power factor of a pure resistive circuit is
A) zero B) unity C) lagging D) leading

ii) The average power consumption is a pure inductor is
A) maximum B) minimum C) zero D) infinite

iii) The admittance is _____ impedance.
A) equal to B) square of C) reciprocal of D) square root of

iv) A series R.C. circuit of 6 – j8Ω carries a current of 10A then its power consumption is
A) 60 W B) 600 W C) 100 W D) 80 W

b. Define and derive an expression for root mean square value of an alternating quantity. **(06 Marks)**

c. Show that current leads voltage in R-C series circuit. **(04 Marks)**

d. An impedance in parallel with a 100 μP capacitor is connected across a 200 V, 50 Hz supply. The coil takes a current of 4A and power loss in the coil is 600 W. Calculate (i) resistance of the coil (ii) inductance of the coil (iii) the power factor of the circuit. **(06 Marks)**

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

i) In a 3 ph. System emfs are
A) 30° apart B) 60° apart C) 90° apart D) 120° apart

ii) In a 'O' connected system relation between I_L and I_{ph} is
A) $I_L = I_{ph}$ B) $I_L = I_{ph}/\sqrt{3}$ C) $I_L = \sqrt{3}\ I_{ph}$ D) $I_L = 3\ I_{ph}$

iii) The total active power in a 3 ph. System is
A) $\sqrt{3}\ V_L I_L$ B) $\sqrt{3}\ V_L I_L \cos\phi$ C) $V_L I_L$ D) $\sqrt{3}\ V_L I_L \sin\phi$

iv) If the two wattmeters show equal reading, power factor is
A) zero B) 0.5 C) unity D) 0.866

b. With the help of connection diagram and phasor diagram show that two wattmeters are sufficient to measure the active power in a three phase three wire system with balanced star connected load. **(10 Marks)**

c. A 3 phase 230 V supply is given to balanced load which is Δ connected. Impedance in each phase of the load is 8 + j6 Ω. Determine the phase current and the total power consumed. **(06 Marks)**

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

i) In a dynamometer wattmeter the fixed coil is
A) current coil B) Potential coil C)current or pressure coil D) None of these

ii) In the energy meter, constant speed of rotation of disc is provided by
A) shunt magnet B) series magnet C) brake magnet D) creeping holes

iii) Ratio minimum fusing current / current rating is fuse is
A) fusing factor B) rated current C) fusing current D) melting current

iv) A good earthing should provide _____ resistance in earthing point.
A) low B) high C) medium D) very high

b. With a neat diagram, explain the construction and principle of operation of a single phase induction energy meter. **(08 Marks)**

c. With a neat diagram, explain the two-way control of a lamp. **(04 Marks)**

d. What are the precautions to be taken against electric shock? **(04 Marks)**

PART – B

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

i) The emf generated by a d.c. generator depends on _____
A) Flux only B) speed only C) Flux & Speed D) Terminal voltage

ii) For 'P' pole lap wound armature DC machine, no. of parallel ports ____
A) 2 B) 2P C) P D) P/2

iii) Yoke is made up of _____
A) Copper B) Aluminium C) Cast steel D) Cast Iron

iv) In a 240 V d.c. motor, $E_b = 220$ V, $R_a = 0.5\ \Omega$, I_a is ___
A) 20 A B) 10 A C) 80 A D) 40 A

b. With a neat sketch, explain the construction of a d.c machine. **(06 Marks)**

c. Derive the torque equation of d.c. motor. **(05 Marks)**

d. A 4 pole generator with wave wound armature has 51 slots each having 24 conductors. The flux per pole is 0.01 Weber. At what speed the armature rotate to give an induced emf of 220 V? What will be the voltage of the winding in lap and the armature rotates at the same speed. **(05 Marks)**

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

i) The copper loss of certain transformer at half full load is 200 W. Then the full load copper loss is
A) 100 W B) 200 W C) 400 W D) 800 W

ii) If secondary current of 100/10 V transformer is 10 A, then primary current is
A) 1 A B) 2 A C) 10 A D) 100 A

iii) The core of a transformer is laminated to reduce
A) eddy current B) hysteresis current C) copper loss D) friction loss

iv) The frequency loss of secondary voltage is _____ that of primary voltage.
A) greater than B) less than C) same as D) double

b. Explain the principle of operation of a single phase transformer. Mention the types of transformers. **(08 Marks)**

c. A 600 kVA, 1 ph transformer has an efficiency of 92% both at full load and half load upf. Determine the efficiency at 75% full load 0.9 power factor. **(08 Marks)**

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

i) A 4 pole, 1200 rpm alternator generates emf at a frequency of
A) 25 Hz B) 40 Hz C) 50 Hz D) 60 Hz

ii) The field winding of an alternator is excited by
A) dc B) ac C) ac & dc D) 3 ph. ac

iii) A salient pole field construction is used for alternator having
A) low & medium speed B) large speed C) very large speed D) none of these

iv) The values of pitch factor (k_P) for full pitch
A) less than 1 B) more than 1 C) 1 D) 0

b. Derive the emf equation for a star connected 3 phase synchronous generator. **(06 Marks)**

c. Sketch the two types of rotors used in an alternator. **(04 Marks)**

d. A 12 pole 500 rpm star connected alternator has 48 slots with 15 conductors per slot. The flux per pole is 0.02 web. and is distributed sinusoidally. The winding factor is 0.97 and pitch factor is 0.98. Calculate the line emf. **(06 Marks)**

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

i) The clip of an induction motor at standstill is
A) 0 B) 1 C) ∞ D) -1

ii) Synchronous speed of three ph. Induction motor is given by
A) $N_s = 120\ fP$ B) $120f/P$ C) $120\ P/f$ D) $fP / 120$

iii) A 4 pole, 440 V, 50 Hz induction motor is running at a slip of 4% the speed of motor is
A) 1260 rpm B) 1440 rpm C) 1500 rpm D) 1560 rpm

iv) Speed of an induction motor is _____ that of N_s
A) greater than B) less than C) same as D) double

b. Prove that a rotating magnetic field of constant magnitude is produced when the stator winding of a polyphase induction motor are energized by a balanced 3 phase supply. Explain the principle of operation of induction motor. **(10 Marks)**

c. A 4 pole, 3 phase, 50 Hz induction motor runs at a speed of 1470 rpm. Find the frequency of the induced emf in the rotor under this condition. **(06 Marks)**

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