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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 : (04 Marks)
- i) Ohm's law does not hold good for non-metallic conductors such as ____
 A) Copper B) Aluminium
 C) Silver D) Silicon carbide
 - ii) The direction of magnetic field produced by a linear current is given by ____
 A) Flemings left hand rule B) Right hand thumb rule
 C) Amper's law D) Lenz's law
 - iii) For ideal voltage source, the value of internal resistance is
 A) 1 B) ∞
 C) zero D) None of these
 - iv) Equivalent inductance of series aiding of two coil connection is
 A) $L_{eq} = L_1 + L_2 - 2M$ B) $L_{eq} = L_1 + L_2 + 2M$
 C) $L_{eq} = L_1 + 2L_2 + M$ D) $L_{eq} = 2L_1 + L_2 - M$
- b. A resistance R is connected in series with a parallel circuit comprising two resistances of 12 Ω and 8 Ω . The total power dissipated in the circuit is 700 watts when the applied voltage is 200V. Calculate the value of R. (06 Marks)
- c. State and explain Faraday's law of electromagnetic induction and state Lenz's law also. (05 Marks)
- d. Two coupled coils of self inductances 0.8 H and 0.20 H, have a co-efficient of coupling 0.9. Find the mutual inductance and turns ratio. (05 Marks)
- 2** a. Choose your answers for the following : (04 Marks)
- i) The sinusoidal currents are given by $i_1 = 10 \sin(\omega t + \pi/3)$, $i_2 = 15 \sin(\omega t - \pi/4)$. The phase difference between them in degrees is
 A) 15° B) 105° C) 60° D) 45°
 - ii) The peak factor is given by $K_p =$ ____
 A) 1.414 B) 1.11 C) 0.707 D) 0.635
 - iii) When the frequency of the applied voltage in R.L series circuit is increased the inductive reactance ____
 A) decreases B) becomes zero C) increases D) remains same
 - iv) The power factor of R.L.C. series circuit, when $X_L > X_C$
 A) lagging B) leading C) unity D) zero
- b. Derive equations for the rms value and average value of a sinusoidally varying current. (06 Marks)
- c. Derive an equation for the power consumed by a R-C series circuit. Draw the waveforms of voltage, current and power. (05 Marks)
- d. A circuit consists of a resistance of 20 Ω and an inductance of 0.05 H connected in series. A supply of 230V, 50Hz is applied to the circuit. Find the current, power factor and power consumed by the circuit. (05 Marks)

- 3 a.** Choose your answers for the following : **(04 Marks)**
- i) The algebraic sum of instantaneous phase currents on a three phase balanced system is
 - A) one
 - B) zero
 - C) infinity
 - D) none of these
 - ii) In star connected system, the relation between the line voltage and phase voltage is
 - A) $E_l = E_{ph}$
 - B) $E_{ph} = \sqrt{3} E_l$
 - C) $E_l = \sqrt{3} E_{ph}$
 - D) $E_l = 3 E_{ph}$
 - iii) In the two-wattmeter method of measuring 3-phase power, one of the wattmeter reads zero, when the load angle power factor angle is
 - A) 60°
 - B) 0°
 - C) 90°
 - D) 30°
 - iv) The expression of 3.ϕ power equation in terms of phase values
 - A) $3 V_{ph} I_{ph} \sin \phi$
 - B) $\sqrt{3} V_{ph} I_{ph} \cos \phi$
 - C) $3 V_{ph} I_{ph} \cos \phi$
 - D) $\sqrt{3} V_{ph} I_{ph} \sin \phi$
- b.** With relevant vector diagram, show that two wattmeters are sufficient to measure three-phase power. **(08 Marks)**
- c.** Three equal impedances, each having a resistance of 8Ω and inductive reactance of 6Ω are connected in i) Star ; ii) Delta, across a 3-phase, 440V supply
Find :
- i) Phase current
 - ii) Line current
 - iii) Total power consumed by the circuit in both cases. **(08 Marks)**
- 4 a.** Choose your answers for the following : **(04 Marks)**
- i) The number of revolution of the disc in energy meter is directly proportional to the consumed ____
 - A) power
 - B) energy
 - C) voltage
 - D) current
 - ii) Integrating meters are used for the measurement of ____
 - A) current
 - B) voltage
 - C) power
 - D) energy
 - iii) In a dynamometer wattmeter, the moving coil is ____
 - A) potential coil
 - B) current coil
 - C) current or potential coil
 - D) none of these
 - iv) A good earthing should provide ____ resistance in earthing path
 - A) medium
 - B) high
 - C) low
 - D) none of these
- b.** Explain with a neat diagram the working of dynamometer type wattmeter. **(08 Marks)**
- c.** With a neat diagram explain plate earthing. **(04 Marks)**
- d.** Define the following terms with reference to fuses :
- i) Rated current
 - ii) Fusing current
 - iii) Fusing factor. **(04 Marks)**

PART – B

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

 - The commutator converts in the dc machine ____
 A) ac to ac B) dc to ac
 C) ac to dc D) dc to dc
 - The direction of the force in Dc motor is given by
 A) Fleming's left hand rule B) Fleming's right hand rule
 C) Lenz's law D) Cork screw rule
 - Electrical equivalent of the mechanical power developed by the armature is equal to
 A) $V_a I_a$ B) $E_b I_a$
 C) $I_a^2 R_a$ D) none of these
 - For DC series motor, torque is proportional to
 A) I_a^2 B) I_a
 C) V^2 D) none of these

b. With a neat sketch, explain the construction of the DC machine showing the various parts. **(06 Marks)**

c. Give the classification of DC motor, sketch the various characteristics of shunt and series motor and mention their applications. **(06 Marks)**

d. A 4 pole, 500V shunt motor has 720 conductors wave connected on its armature, the full load armature current is 60A and the flux per pole is 0.03 wb. The armature resistance is 0.2Ω and the contact drop is 1V per brush. Calculate the full load speed. **(04 Marks)**

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

 - The core of the transformer is laminated to reduce
 A) friction loss B) copper loss
 C) hysteresis loss D) eddy current loss
 - The iron losses depend on the maximum value of the
 A) input voltage B) input current
 C) flux density D) frequency
 - If copper loss of a transformer at 1/2 full load is 200 watts then its full load copper loss would be
 A) 200 W B) 400 W
 C) 1600 W D) 800 W
 - The copper losses in the transformer vary as the square of the
 A) voltage B) power
 C) flux density D) current

b. Derive an expression for the electromotive force induced in the secondary winding of a transformer. **(05 Marks)**

c. Define the efficiency of a transformer and derive the condition for which the efficiency of a transformer is maximum. **(05 Marks)**

d. A 600 KVA transformer has an efficiency of 92% at full load unity p.f. and half load, 0.9 p.f. Determine its efficiency at 75% of full load and 0.9 p.f. **(06 Marks)**

- 7 a. Choose your answers for the following : (04 Marks)
- A 6 pole, 1000 rpm alternator generates emf at a frequency of
 A) 60 Hz B) 40 Hz
 C) 25 Hz D) 50 Hz
 - A smooth cylindrical type rotor is used for alternator having
 A) low speed B) low and medium speed
 C) high speed D) none of these
 - For full pitch coil, the pitch factor K_p is
 A) less than 1 B) 1
 C) greater than 1 D) none of these
 - The number of cycles generated in a 8-pole alternator in one revolution is
 A) 4 B) 2
 C) 8 D) 16
- b. Obtain expression for emf of an alternator and explain the significance of winding factor. (06 Marks)
- c. How are alternators classified? With neat figures, give the constructional difference between them. (05 Marks)
- d. A 6 pole, three phase star connected alternator has an armature with 90 slots and 8 conductors per slot and rotates at 1000 rpm. The flux per pole is 0.05 wb. Calculate the emf generated, if the winding factor is 0.97 and pitch factor is unity. (05 Marks)
- 8 a. Choose your answers for the following : (04 Marks)
- In three-phase IM a rotating magnetic field of constant magnitude
 A) $\frac{\sqrt{3}}{2} \phi_m$ B) $1.5 \phi_m$
 C) $-\frac{\sqrt{3}}{2} \phi_m$ D) $-1.5 \phi_m$
 - A 4 pole, 50Hz induction motor runs with a slip of 4%. What is the speed of motor?
 A) 1500 rpm B) 1400 rpm
 C) 1440 rpm D) 1000 rpm
 - An induction motor under full load has a slip of about
 A) 0.03 B) 0.3
 C) 0.1 D) zero
 - The frequency of rotor induced current is given by
 A) $f' = f/s$ B) $f' = sf$
 C) $f' = \sqrt{sf}$ D) $f' = (1 - s) f$
- b. Explain the concept of rotating magnetic field in a 3 ϕ induction motor. (06 Marks)
- c. Define a slip. Derive expression for the slip and frequency of rotor current. (05 Marks)
- d. A 3-phase induction motor has 6 poles and runs at 960 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)

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