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First/Second Semester B.E. Degree Examination, June/July 2011
Basic Electrical Engineering

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer 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

- Choose the correct answer:
 - As per Ohms law
A) $V \propto I$ B) $V \propto R$ C) $I \propto R$ D) $V = IR$.
 - A 2 Ω resistor is connected in series with parallel combination of 10 Ω and 15 Ω resistors. Then heat dissipated in kWsec for 1 hour in circuit, when current of 2 A flowing in 2 Ω resistor is.
A) 115.5 B) 1.152 C) 11.52 D) 115200
 - The flux linkage between the coils is maximum, when $m = ?$
A) $\frac{1}{\sqrt{L_1 L_2}}$ B) $\sqrt{L_1 L_2}$ C) $L_1 = L_2$ D) L_1 / L_2
 - If the energy stored in a coil is 2 joules for a current of 2A flowing, then the inductance of coil is,
A) 0.01 H B) 0.1 H C) 1H D) 10H. (04 Marks)
 - State and explain Kirchoff's laws as applied to DC circuits. (06 Marks)
 - Explain Fleming's right hand rule and Fleming's left hand rule as applied to electrical machines. (06 Marks)
 - Find the self inductance of a coil of 200 turns, wound on a paper core tube of 25 cm length and 5 cm radius. Also calculate energy stored in it if current rises from 0 to 5A (l/r for paper = 1). (04 Marks)
- Choose the correct answer:
 - Given $(8 + j6) \times (-10 - j7.5)$, then the result in polar form is
A) 12.5 $\angle -143.1$ B) 125 $\angle -106.2^\circ$ C) 125 $\angle +106.2^\circ$ D) 12.5 $\angle 143.1$
 - An alternating emf is given by $e = 200\sin 314t$. The instantaneous value of emf at $t = 1/200$ sec is
A) 150 V B) 175 V C) 200 V D) 225 V.
 - An alternating current is given by $I = I_m \sin 2\omega t$. Then frequency of the alternating current is,
A) ω/π Hz B) $2\omega/\pi$ Hz C) $\omega/2\pi$ Hz D) none of these
 - The reactance of a capacitor at 50 Hz is 5 Ω . If the frequency is increased to 100 Hz, the new reactance is,
A) 5 Ω B) 2.5 Ω C) 10 Ω D) 25 Ω . (04 Marks)
 - Define average and RMS value of all alternating current and find their relation with max value, if the alternating quantity is sinusoidal. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification details will be treated as malpractice.

- c. In a series parallel circuit, the two parallel branches A & B are in series with C. The impedances are $Z_A = (10 - j8)\Omega$, $Z_B = (9 - j6)\Omega$ & $Z_C = (3 + j2)\Omega$. The voltage across branch C is 100V. Find the currents I_A & I_B and the phase difference between them.

(08 Marks)

- 3 a. Choose the correct answer:

i) When power factor is 0.5, the wattmeter reading is such that
 A) $w_1 = w_2$ B) w_1 is +ve, w_2 is -ve C) w_1 is +ve, $w_2 = 0$ D) $w_1 = 2 w_2$.

ii) The relation between line and phase quantities in a delta connection is

A) $E_l = \sqrt{3} E_{ph}$, $I_l = I_{ph}$ B) $E_l = E_{ph}$, $I_l = \sqrt{3} I_{ph}$

C) $E_l = \sqrt{3} E_{ph}$, $I_l = \sqrt{3} I_{ph}$ D) $E_l = E_{ph}$, $I_l = I_{ph}$.

iii) The angle between line voltage and phase voltage for a balanced star connected circuit is

A) 30° B) $30^\circ \pm \phi$ C) 60° D) 120° .

iv) In a 3ϕ system, if the instantaneous value of phase R and Y are +60V and -40V respectively, then instantaneous voltage of phase B is

A) -20 V B) 40 V C) 120 V D) none of the above. (04 Marks)

b. What are the advantages of 3ϕ AC systems over 1ϕ AC system? (04 Marks)

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

d. Three coils each of impedance $20\angle 60^\circ$ are connected in star to a 3ϕ , 400 V, 50 Hz supply. Find the reading on each of the two wattmeters connected to measure the power input. (06 Marks)

- 4 a. Choose the correct answer:

i) Under no load condition, the revolution of the disc due to kinetic energy of an energy meter can be blocked by

A) Brake magnet B) Electromagnet
 C) Creeping hole with Brake magnet D) Copper shading band.

ii) The minimum fusing current of a fuse wire is 2.1 A and fusing factor is 1.1. Then, the rated carrying current of the fuse element is,

A) 2.2 A B) 2.31 A C) 1.909 A D) 0.5238 A.

iii) Coke can be used as a sandwich between salt of an earthing system, to

A) by pass the current B) avoid melting of the salt
 C) improve conductivity D) to hold moisture content.

iv) When the pointer of an indicating instrument comes to rest in the final deflection position, then

A) Only controlling torque acts B) Only deflecting torque acts
 C) Both torques act D) None of these. (04 Marks)

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

c. With a neat sketch, explain any three types of wiring. (06 Marks)

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

PART - B

- 5 a. Choose the correct answer:
- The yoke of a DC machine is made of
A) Silicon steel B) Soft iron C) Aluminum D) Cast steel.
 - Carbon brushes are used in a DC machine because
A) Carbon lubricates and polishes the commutator B) Contact resistance is decreased
C) Carbon is cheap D) none of these.
 - The efficiency of a DC generator means its
A) Electrical efficiency B) Overall efficiency
C) Mechanical efficiency D) None of the above.
 - A DC motor is still used in industrial applications because it is
A) Cheap B) Simple in construction
C) Provides fine speed control D) none of these (04 Marks)
- b. Explain with a neat sketch the constructional features of a DC machine and mention the function of each part. (05 Marks)
- c. What is the significance of back emf under no load and full load condition in a DC motor? (04 Marks)
- d. A 4 pole DC shunt motor takes 22A from 220V supply. The armature and field resistances are respectively 0.5Ω and 100Ω respectively. The armature is lap connected with 300 conductors. If the flux per pole is 20 mWb , calculate the speed and gross torque. (07 Marks)
- 6 a. Choose the correct answer:
- A transformer transfers electrical energy from primary to secondary usually with a change in
A) frequency B) power C) voltage D) time period.
 - when the supply frequency of a transformer is doubled then the hysteresis losses
A) remain same B) doubled
C) reduced by 50% D) hysteresis loss equal to eddy current loss.
 - Regulation and efficiency of a transformer should be respectively
A) high, high B) high, low
C) low, high D) low, low
 - The full load copper loss for a transformer is 800 W, then the copper loss at half the full load is
A) 400 W B) 800 W C) 200 W D) 1600 W (04 Marks)
- b. What are the various types of losses and how to overcome these losses in a transformer? (08 Marks)
- c. The max. efficiency at full load and upf of a 1ϕ , 25 KVA, 500 /1000 V, 50 Hz, transformer is 98%. Determine its efficiency at i) 75% load, 0.9 pf ii) 50% load, 0.8 pf iii) 25% load, 0.6 pf. (08 Marks)

- 7 a. Choose the correct answer:
- The stator of an alternator is identical to that of a
 - DC generator
 - three phase induction motor
 - single phase induction motor
 - none of these.
 - The field winding of an alternator is _____ excited.
 - DC
 - AC
 - Both DC and AC
 - none of these
 - High speed alternators are driven by
 - diesel engine
 - hydraulic turbines
 - steam turbines
 - none of these.
 - The disadvantages of a short pitched coils in an alternator is that
 - harmonics are introduced
 - waveform become non sinusoidal
 - voltage round the coil is reduced
 - none of the above.
 (04 Marks)
- 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, 500 rpm, Δ connected alternator has 60 slots, with 20 conductors 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 answer:
- The difference between synchronous speed and actual speed is 100 rpm and the synchronous speed is 1500 rpm, then the value of slip is
 - 2%
 - 10%
 - 6.66%
 - 15%.
 - External resistance is connected to the rotor of a 3 ϕ phase wound induction motor in order to
 - reduce starting current
 - collector current
 - as a star connected load
 - none of these.
 - When the rotor of a 3 ϕ induction motor is blocked, the slip is
 - zero
 - 0.5
 - 0.1
 - 1.
 - Phase wound induction motors are less extensively used than squirrel cage induction motors because,
 - slip rings are required on the rotor circuit
 - rotor windings are generally star connected
 - they are costly and require greater maintenance
 - none of the above.
 (04 Marks)
- b. Explain the working principle of a 3 ϕ induction motor and give reasons for "An induction motor can not run at synchronous speed". (06 Marks)
- c. Define slip. Derive an expression for frequency of rotor current. (04 Marks)
- d. An 8 pole alternator runs at 750 rpm, and supplies power to a 6 pole, 3 ϕ induction motor which runs at 970 rpm. What is the slip of the induction motor? (06 Marks)
