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First/Second Semester B.E. Degree Examination, June/July 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.*

PART – A

1 a. Choose the correct answer: **(04 Marks)**

i) Ohm's law is applicable to only
A) Linear circuits B) Non-linear circuits
C) Non-linear elements D) None of these

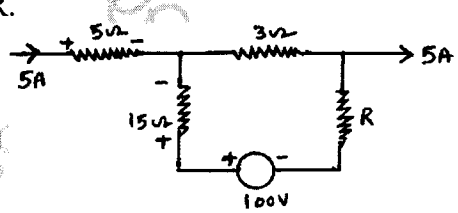
ii) The direction of dynamically induced emf in a conductor can be found by
A) Fleming's right hand rule B) Fleming's left hand rule
C) Lenz's law D) Cork screw rule

iii) In parallel circuit, the potential difference across each branch remain ____
A) Different B) Same C) Varies with time D) None of these

iv) A coil of 500 turns is linked by a flux of 0.4 milli meter. If the flux is reversed in 0.01 sec, then the emf induced in a coil is ____
A) 20 volts B) 30 volts C) 40 volts D) zero volts.

b. The voltage drop across the 15Ω resistor in the circuit shown in Fig.Q.1(b) is 30V having the polarity indicated. Find R. **(06 Marks)**

Fig.Q.1(b)



c. State and explain Kirchoff's laws. **(05 Marks)**

d. Derive the expression for dynamically induced emf. **(05 Marks)**

2 a. Choose the correct answer: **(04 Marks)**

i) The power factor of pure inductive circuit is _____
A) Unity B) Zero C) Lagging D) Leading

ii) When the frequency of the applied voltage in series RL circuit is increased, then inductive reactance will ___
A) Increase B) Decrease C) Becomes zero D) Remains same

iii) A sinusoidal voltage is represented by v = 283 sin 100πt. Then frequency of supplied voltage is ____
A) 60 c/s B) 40 c/s C) 50 c/s D) 30 c/s

iv) The power factor of the ac circuit is given by ____
A) Z/R B) R/Z C) RZ D) None of these

b. The instantaneous values of the current and voltage in ac circuit are given by i = 28.28 sin (314t - π/3) Amps, v = 282.8 sin (314t) volts. Find: i) RMS value of current and voltage; ii) Average value of current and voltage; iii) Frequency of supply voltage; iv) Power in the circuit. **(08 Marks)**

c. A resistance of 25Ω, an inductive reactance of 20Ω and a capacitive reactance of 50Ω are all connected in parallel across 100V as supply. Calculate: i) Current in each branch; ii) Total current drawn from the supply; iii) Circuit power factor and power consumed. **(08 Marks)**

3 a. Choose the correct answer: **(04 Marks)**

i) In a 3ϕ, 4 wire system, under balanced condition, neutral conductor carries
A) Maximum current B) Zero current
C) Minimum current D) Either maximum or minimum

ii) In measurement of 3ϕ power by two wattmeter method, if the two wattmeter readings are equal but of opposite sign, then the power factor of the circuit is ____
A) 0.9 lag B) 0.8 lead C) Unity D) Zero

iii) The reactive power taken by the 3ϕ loads is given by the expression
A) $3V_LI_L \cos\phi$ B) $\sqrt{3}\, V_LI_L \cos\phi$ C) $\sqrt{3}\, V_LI_L \sin\phi$ D) $3V_LI_L \sin\phi$

iv) The current coil of a wattmeter is connected in series with line is made up of
A) High resistance B) Low resistance
C) Medium resistance D) Very high resistance

b. Obtain the relationship between the phase and line values of voltages and currents in a delta connected system. **(08 Marks)**

c. The power input to 2000V, 50Hz, 3ϕ motor running on full load at an efficiency of 90% is measured by two watt meters which indicate 300 kW and 100 kW respectively. Calculate: i) The input; ii) The power factor; iii) The line current; iv) The output. **(08 Marks)**

4 a. Choose the correct answer: **(04 Marks)**

i) Earthing brings the body of the equipment to
A) High potential B) Low potential
C) Medium potential D) Zero potential

ii) The fuse can protect the electrical circuit under
A) Over loading B) Under loading C) No load D) None of these

iii) In a dynamometer wattmeter the fixed coil is
A) Current coil B) Potential coil
C) Current or potential coil D) None of these

iv) The average torque acting on the aluminum disc of an energy meter is proportional to the ____ consumed by the circuit:
A) Current B) Voltage C) Power D) None of these

b. Explain with a neat diagram the working of dynamometer type wattmeter. **(08 Marks)**

c. Explain the two-way position and three-way position control of lamp. **(08 Marks)**

PART – B

5 a. Choose the correct answer: **(04 Marks)**

i) The relationship between the terminal voltage and generated emf in DC generator is _____
A) $E_g = V - I_aR_a$ B) $E_g = V + I_aR_a$ C) $E_g = V$ D) None of these

ii) Brushes in DC machines made up of
A) Mica B) Cast iron C) Carbon D) None of these

iii) Which DC motor will be preferred for variable speed?
A) Shunt motor B) Compound motor
C) Series motor D) Cumulative compound motor

iv) In DC machine series field winding made up of
A) Low resistance B) High resistance
C) Very high resistance D) None of these.

b. An 8-pole, lap connected armature has 960 conductors, a flux of 40 mwb/pole and speed of 400 rpm. Calculate the emf generated. If the armature were wave connected, at what speed must it be driven to generate 400V? **(08 Marks)**

c. Explain the characteristics of DC shunt motor. Also mention its applications. **(08 Marks)**

6 a. Choose the correct answer: **(04 Marks)**

i) Transformer transfer electrical energy from one circuit to another circuit without _____
A) Change in voltage B) Change in frequency
C) Change in power D) None of these

ii) Eddy current loss in a transformer can be reduced by using ____
A) Laminated core B) Solid core
C) Silicon content solid core D) None of these

iii) If copper loss of a transformer at full load is 1600 W, then copper loss at $1/4^{th}$ full load is _____. A) 400 W B) 800 W C) 200 W D) 100 W

iv) The transformation ratio of transformer is given by
A) $\frac{V_1}{V_2}$ B) $\frac{V_2}{V_1}$ C) $\frac{I_2}{I_1}$ D) $\frac{V_1 I_1}{V_2 I_2}$

b. Derive an EMF equation of a 1ϕ transformer. **(06 Marks)**

c. What are the losses in transformer? Obtain the condition for maximum efficiency. **(05 Marks)**

d. Find the number of turns on the high voltage side of 415/240V, 50Hz single phase transformer, if the area of cross-section of the core is 25 sq.cm and the maximum flux density if 1.3 wb/m^2. **(05 Marks)**

7 a. Choose the correct answer: **(04 Marks)**

i) A 4 pole, 1500 rpm alternator generates at a frequency of
A) 25 Hz B) 60 Hz C) 40 Hz D) 50 Hz

ii) Pitch factor $k_p = 1$ for _____
A) Full pitch coil B) Short pitch coil C) Fractional pitch coil D) None of these

iii) The salient pole field construction is used for _____ alternator
A) Low and medium speed B) Large speed
C) Very large speed D) None of these

iv) To improve the voltage waveform in alternator _____ windings are used
A) Short pitched B) Full pitched C) Fractional pitched D) None of these.

b. Explain the construction of salient pole alternator. **(06 Marks)**

c. Derive an EMF equation of an alternator. **(05 Marks)**

d. A 6 pole, 1200 rpm, star connected alternator has 48 slots with 15 conductors/slot. The flux/pole is 0.03 Wb and is distributed sinusoidally. The winding factor is 0.96. Calculate the line emf. **(05 Marks)**

8 a. Choose the correct answer: **(04 Marks)**

i) The slip of an induction motor at stand still is
A) 1 B) 0 C) ∞ D) None of these

ii) A 4 pole, 50 Hz induction motor runs at a speed of 1450 rpm. The frequency of the rotor induced emf is
A) 3 Hz B) 2.5 Hz C) 1.66 Hz D) 1 Hz

iii) Induction motor runs with
A) Asynchronous speed B) Synchronous speed
C) Above synchronous speed D) None of these

iv) Slip of 3ϕ induction motor is given by
A) $\frac{N_S}{N_S - N}$ B) $\frac{N_S - N}{N_S}$ C) $(N_S - N)$ D) None of these.

b. Explain constructional features of 3ϕ induction motor. **(06 Marks)**

c. Explain the principle of operation of a 3ϕ induction motor. **(05 Marks)**

d. A 6 pole induction motor is supplied from a 50 Hz supply has an emf in the rotor of frequency 2.5 Hz. Determine: i) Slip; ii) The speed of the motor. **(05 Marks)**

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