First / Second Semester B.E. Degree Examination, June-July 2009
Basic Electrical Engineering

Time: 3 hrs.   Max. Marks:100

Note : 1. *Answer any Five full question, choosing at least two from each part.*
   2. *Answer all objectives type questions only in OMR sheet page 5 of the Answer Booklet.*
   3. *Answer to the objective type questions on sheets other than OMR will not be valued*

PART – A

1 a. i) A series circuit consists of 4.7KΩ, 5.6KΩ, 9KΩ and 10KΩ resistors, which resistor has the most voltage across it?_____
      A) 4.7KΩ   B) 5.6KΩ   C) 9KΩ   D) 10KΩ
   ii) The power dissipation in each of three parallel branches is 1W. The total power dissipation of the circuit is _____
      A) 1W   B) 4W   C) 3W   D) 9W
   iii) The direction of induced emf in a conductor can be deduced by _____.
      A) Fleming's Left Hand rule   B) Fleming's Right Hand rule
      C) Cork screw rule   D) Lenz's law.
   iv) The maximum value of coefficient of coupling is _____
      A) 100%   B) more than 100%   C) 90%   D) none of these   (04 Marks)
   b. Obtain the potential difference Vxy in the circuit of fig.Q1(b).   (06 Marks)
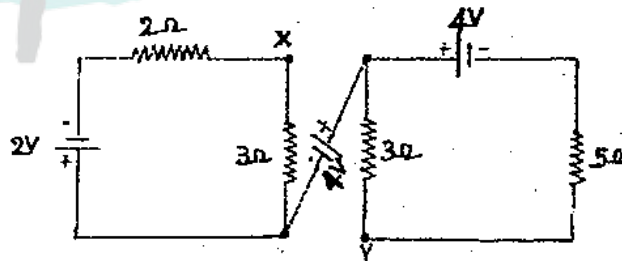

Fig.Q1(b)

   c. Derive an expression for energy stored in the magnetic field.   (04 Marks)
   d. Define coefficient of coupling and establish relation between self inductance, mutual inductance with coefficient of coupling.   (06 Marks)

2 a. i) The time period of a sinusoidal wave form with 200Hz frequency is _____
      A) 0.05S   B) 0.005S   C) 0.0005S   D) 0.5S
   ii) The peak value of a sine wave is 400V, its average value is _____
      A) 254.6V   B) 282.6V   C) 400V   D) 565.5V
   iii) In a certain RL circuit, $V_R = 2V$ and $V_L = 3V$. The magnitude of total voltage is
_____
      A) 2V   B) 3V   C) 5V   D) 3.6V
   iv) When the frequency of the applied voltage in series RC circuit is increased the capacitance reactance_____
      A) increase   B) decreases   C) becomes zero   D) remains same
                                                                        (04 Marks)

b. Define i) form factor and ii) power factor in ac circuits. **(04 Marks)**
c. Obtain the form factor of full rectified sine wave. **(05 Marks)**
d. When 220V AC supply is applied across AB terminals in the circuit shown in fig.Q2(d), the total power input is 3.25KW and the current is 20amps. Find the current through Z_3. **(07 Marks)**

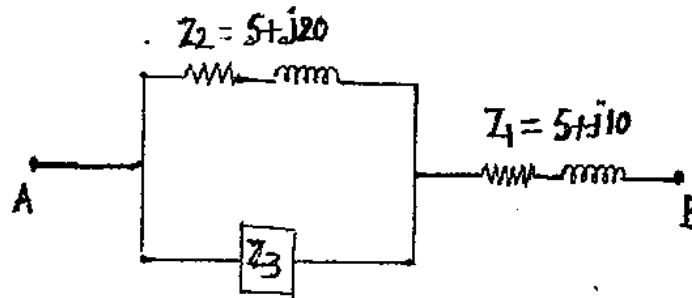$Z_2 = 5 + j20$

$Z_1 = 5 + j10$

A

B

Z_3

Fig.Q2(d)

3 a. i) In a balanced three phase load. the power factor of the three phases are _____
   A) different   B) same   C) zero   D) none of these.

   ii) The power taken by a 3 – phase load is given by the expression _____
   A) $3V_L I_L \cos\phi$ B) $\sqrt{3}\, V_L I_L \cos\phi$ C) $3V_L I_L \sin\phi$ D) $\sqrt{3}\, V_L I_L \sin\phi$

   iii) In the 2 wattmeter method of measuring 3 – phase power, the two watt meters indicate equal and opposite readings when the load power factor angle is _____ degrees lagging.
   A) 60   B) 0   C) 30   D) 90

   iv) In delta connected system, the relation between the line current I_L and phase current I_{ph} is _____
   A) $I_L = I_{ph}$ B) $I_L = I_{ph}/\sqrt{3}$ C) $I_L = \sqrt{3}\, I_{ph}$ D) $I_L = 3I_{ph}$. **(04 Marks)**

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

   c. A balanced three phase star connected load draws power from 440V supply. The two watt meters connected indicate $W_1 = 5KW$ and $W_2 = 1.2KW$. Calculate power, power factor and current in the circuit. **(08 Marks)**

4 a. i) A fuse is a _____
   A) current limiting device   B) protective device
   C) voltage limiting device   D) None of these.

   ii) A good earthing should provide _____ resistance in earthing path.
   A) low   B) high   C) medium   D) none of these.

   iii) In the energy meter, constant speed of rotation of disc is provided by _____
   A) shunt magnet   B) series magnet   C) braking magnet   D) none of these

   iv) In the measuring instruments, under equilibrium condition, controlling torque (T_c) and deflecting torque (T_d) are _____
   A) $T_c = T_d$ B) $T_c > T_d$ C) $T_c < T_d$ D) None of these. **(04 Marks)**

   b. Explain with neat diagram working of induction type energy meter. **(08 Marks)**
   c. Why earthing of electrical apparatus is required? Explain. **(04 Marks)**
   d. What is the purpose of fuse? What are the requirements of good fuse? **(04 Marks)**

PART – B

5 a. i) The material for commutator brushes is always_____
        A) mica   B) copper   C) cast iron   D) carbon
      ii) Which DC motor will be preferred for constant speed line shafting _____
        A) cumulatively compound motor   B) differentially compound motor
        C) shunt motor   D) series motor.
      iii) For a 'P' pole lap wound armature of DC machine the number of parallel paths are
          equal to _____
        A) 2   B) 2P   C) P   D) P/2.
      iv) The relationship between the applied voltage and back emf in DC motors is _____
        A) $V = E_b + I_a R_a$ B) $V = E_b - I_a R_a$ C) $V = E_b$ D) none of these.
                                                                              (04 Marks)
   b. Why starter is needed? With neat sketch, explain 3 – point starter used for DC motor.
                                                                              (08 Marks)
   c. A DC series motor is running with a speed of 1000 rpm, while taking a curent of 22 amps
       from the supply. If the load is changed such that the current drawn by the motor is
       increased to 55amps, calculate the speed of the motor on new load. The armature and
       series winding resistances are 0.3Ω and 0.4Ω respectively. Assume supply voltage as
       250V.   (08 Marks)

6 a. i) Losses which donot occur in transformer are _____
        A) copper losses   B) magnetic losses   C) friction losses   D) none of these
      ii) If Copper loss of a transformer at $1/4^{th}$ full load is 100W, then its full load copper
          loss would be _____
        A) 100W   B) 400W   C) 800W   D) 1600W.
      iii) If an ammeter in the secondary of a 100/10V transformer reads 10A, the current in
           the primary would be _____
        A) 1A   B) 2A   C) 10A   D) 100A
      iv) The no load primary current I_0 in transformer _____
        A) is in phase with V_1 B) leads V_1 by 90^0 C) lags behind V_1 by 90^0
        D) lags V_1 by an angle between 0^0 and 90^0.   (04 Marks)
   b. Explain with vector diagram the working principle of transformer on no – load. (06 Marks)
   c. Define the voltage regulation of transformer; what is its importance?   (04 Marks)
   d. The primary winding of a transformer is connected to a 240V, 50Hz supply. The
       secondary winding has 1500 turns. If the maximum value of the core flux is 0.00207 Wb,
       determine i) the secondary induced emf   ii) number of turns in the primary
       iii) cross sectional area of core if the flux density has maximum value of 0.465 Tesla.
                                                                              (06 Marks)

7 a. i) The field winding of an alternator is excited by _____
        A) dc   B) ac   C) both dc and ac   D) none of these.
      ii) For full pitch coil, the pitch factor K_p is_____
        A) 1   B) greater than 1   C) less than 1   D) none of these.
      iii) The number of cycles generated in a 6-pole alternator in one revolution is _____
        A) 3   B) 6   C) 50   D) none of these.
      iv) The non salient pole field construction is used for _____ alternator.
        A) low speed   B) medium speed   C) high speed   D) none of these.
                                                                              (04 Marks)
   b. Enumerate the advantages of having stationary armature and rotating field system in
       large size alternator.   (08 Marks)

c. A 3 – phase, 50Hz, 16 pole alternator with star connected winding has 144 slots with 10 conductors/slot. The flux per pole 24.8m Wb is sinusoidally distributed, the coils are full pitched. Find i) speed and ii) the line emf. Assume winding factor $K_d = 0.96$.

(08 Marks)

8 a. i) The relation between rotor frequency (f') and stator frequency (f) is given by
_____
   A) $f' = sf$ B) $f' = f / s$ C) $f' = \sqrt{sf}$ D) $f' = (1 - s) f$.

   ii) Synchronous speed of three phase induction motor is given by _____
   A) $N_s = 120$ fP   B) $N_s = 120$ f/p   C) $N_s = 120$ p/f   D) $N_s =$ fp/120

   iii) The frame of induction motor is usually made of _____
   A) silicon steel   B) cast iron   C) alluminium   D) bronze

   iv) A 4 pole, 440V, 50Hz induction motor is running at a slip 4%. The speed of motor is
_____
   A) 1260 rpm   B) 1440 rpm   C) 1500 rpm   D) 1560 rpm.   (04 Marks)

b. What is 'slip' in an induction motor? Explain why slip is never zero in an induction motor.

(06 Marks)

c. What are the applications of 3 – phase induction motors?   (04 Marks)

d. If the electromotive force in the stator of an 8 – pole induction motor has a frequency of 50Hz and that in the rotor 1.5Hz, at what speed is the motor running and what is the slip?

(06 Marks)

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