First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Basic electrical Engineering

Time: 3 hrs.   Max. Marks:100

Note: Answer FIVE full questions, selecting
atleast TWO questions from each part.

PART – A

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

     i)   Which of the following does not represent the power

         A) VI   B) V/I   C) I^2R D) J/sec

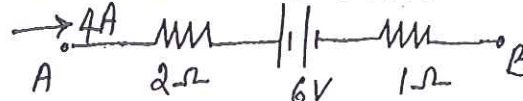   ii)   The potential difference between A and B in Fig. Q1(a)(ii) is

Fig. Q1(a)(ii)

         A) 18V   B) –18V   C) 4V   D) –4V

     iii)   When two identical inductors are connected in series aiding, the effective inductance is

         A) $L_1 + L_2 + 2m$ B) $L_1 + L_2 - 2M$ C) $2L_1 + 2L_2 + M$ D) $2L_1 + 2L_2 - 2M$

     iv)   The coupling between two magnetically coupled coils is said to be ideal if the coefficient of coupling is

         A) 0   B) 0.25   C) 0.5   D) 1.

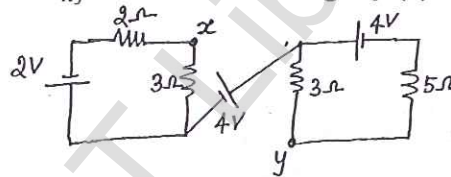   b.   Obtain the potential difference V_{xy} in the circuit of Fig. Q1(b).   (05 Marks)

Fig. Q1(b)

   c.   Define coefficient of coupling and find its relation with L_1, L_2 and M.   (06 Marks)

   d   A coil consists of 600 turns and current of 10 A in the coil gives rise to a magnetic flux of 1 milli weber. Calculate : i) the self inductance ii) the energy stored iii) the self induced emf when current is reversed in 0.01 second.   (05 Marks)

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

     i)   The time period of a sinusoidal waveform with frequency 200 Hz is

         A) 0.05 sec   B) 0.005 sec   C) 0.00055 sec   D) 0.5 sec

     ii)   The rms value of an AC sinusoidal current is 10A it's peak value is

         A) 7.07 A   B) 14.14A   C) 10A   D) 28.28A

     iii)   The power factor of a series RL circuit is given by

         A) $\dfrac{X_L}{R}$ B) $\dfrac{R}{X_L}$ C) $\dfrac{R}{Z}$ D) $\dfrac{Z}{R}$

     iv)   In a series RLC circuit, the inductive reactance is 10 Ω and capacitive reactance is 15Ω. Then the total reactance is

         A) 25Ω   B) 18.03Ω   C) 5Ω   D) 1.5Ω.

   b.   Derive average value of sinusoidal voltage interms of its maximum value.   (04 Marks)

   c.   Prove that current in a purely inductive circuit lags behind the applied voltage by 90°.   (06 Marks)

   d.   A circuit consists of resistance 10Ω an inductance 16 mH and a capacitance of 150 µF connected in series. A supply of 100V, 50 Hz is given to the circuit. Find the current and power consumed by the circuit.   (06 Marks)

3 a. Choose the correct answers for the following :   (04 Marks)
       i)   The frequencies of 3 phase voltage in a three phase balanced system are
            A) different   B) same   C) zero   D) infinity
       ii) Electrical displacement between different phases in a six phase system is
            A) 60°   B) 120°   C) 240°   D) none of these
       iii) A balanced star connected load of $(8 + j6)\Omega$ per phase is connected to a 3 phase 440V
            supply. The line current is
            A) 254.03A   B) 25.403A   C) 103.3A   D) 33.33A
       iv) Two wattmeters connected in a balanced system indicates 4.5 KW, –0.5 KW. The power
            factor of the circuit is
            A) 0.4193   B) 0.707   C) units   D) 0.963.
   b. Obtain the relationship between the phase and line values of voltages and currents in a
       balanced star connected system.   (08 Marks)
   c. Three similar coils each having resistance 10Ω and reactance 10Ω are connected in star
       across 440V, 3-phase supply. Find line current and reading of each two wattmeters
       connected to measure power.   (08 Marks)

4 a. Choose the correct answers for the following :   (04 Marks)
       i)   The electric energy meter installed near the mains switch in a house is
            A) an indicating instrument   B) an integrating instrument
            C) a recording instrument   D) an absolute instrument
       ii) The damping force in an instrument to
            A) oppose the deflecting force   B) oppose the controlling force
            C) bring the pointer to steady position quickly   D) none of these
       iii) A good earthing should provide _____ resistance in earth path
            A) low   B) high   C) medium   D) none of these
       iv) The ratio fusing current to rated current is known as
            A) fuse current ratio B) fuse rated capacity C) fusing factor   D) none of these.
   b. Explain two-way control of a lamp.   (04 Marks)
   c. Explain the principle of operation of dynamometer type wattmeter.   (06 Marks)
   d. Explain with a neat diagram pipe earthing.   (06 Marks)

PART – B

5 a. Choose the correct answers for the following :   (04 Marks)
       i)   The back emf in a DC motor is given as
            A) $V + I_aR_a$ B) $V – I_aR_a$ C) V   D) I_aR_a
       ii) The emf generated by a DC generator depends upon
            A) the flux only ;B) the speed only;C) both the flux and speed ;D) the terminal voltage
       iii) At the moment of starting a DC motor, its back emf is
            A) zero   B) maximum   C) minimum   D) optimum
       iv) The function of a starter in a DC motor is to
            A) control its speed   B) increase its starting torque
            C) limit the starting current to safer value   D) reduce armature reaction.
   b. Mention the classification of DC generator.   (04 Marks)
   c. A shunt wound DC generator delivers 496A at 440V to a load. The resistance of the shunt
       field coil is 110Ω and that of the armature winding is 0.02Ω. Calculate the emf induced in
       the armature.   (04 Marks)
   d. An 8-pole DC generator has 500 conductors on its armature and produces 0.02Wb of flux
       per pole.
       i)   What voltage will it generate at a speed of 1800 pm if armature is a) lap wound and b) if
            armature is wave wound?
       ii) If the allowable current is 5A per path, what KW power generated by the machine when
            a) lap wound b) wave wound.   (08 Marks)

6 a. Choose the correct answers for the following : **(04 Marks)**
   i) The eddy current loss in a transformer is minimized by using
      A) solid core   B) laminated core   C) plastic core   D) none of these
   ii) If an ammeter in the secondary of a 100V/10V transformer reads 10A, the current in the primary would be
      A) 1A   B) 2A   C) 10A   D) 100A
   iii) Efficiency of a transformer is maximum when
      A) copper loss $= \sqrt{\text{core loss}}$ B) core loss $= \sqrt{\text{copper loss}}$
      C) copper loss = core loss   D) none of these
   iv) Losses which do not occur in a transformer is
      A) copper losses   B) magnetic losses   C) friction losses   D) none of these.

   b. Explain briefly the principle of operation of a transformer and show that the voltage ratio of primary and secondary windings is the same as their turns ratio. **(04 Marks)**
   c. Derive the condition for maximum efficiency in a single-phase transformer. **(04 Marks)**
   d. In a 25 KVA, 2000/200V transformer, the iron and copper losses are 350 watts and 400 watts respectively, calculate the efficiency at UPF at half full load. **(08 Marks)**

7 a. Choose the correct answers for the following : **(04 Marks)**
   i) A 6 pole 1000 rpm alternator generates emf at a frequency of
      A) 60 Hz   B) 40 Hz   C) 25 Hz   D) 50 Hz
   ii) 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
   iii) Frequency of supply in India is
      A) 60 Hz   B) 25 Hz   C) 50 HZ   D) 75 Hz
   iv) The frequency of emf generated by an alternator depends upon the alternator speed N and number of poles P is given by
      A) $\dfrac{PN}{60}$ B) $\dfrac{60N}{P}$ C) $\dfrac{PN}{120}$ D) $\dfrac{120N}{P}$

   b. Obtain expression for emf of an alternator. **(06 Marks)**
   c. What are the advantages of stationary armature? **(04 Marks)**
   d. A 3 phase 50 Hz 16 pole alternator with star connected windings has 144 slots with10 conductors/slot. The flux per pole is 24.8 mwb. The coils are full pitched and assume $k_d = 0.96$; find : i) speed ii) the line emf. **(06 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**
   i) An induction motor works with
      A) DC only   B) AC only   C) both AC and DC   D) none of these
   ii) A 3-phase 50Hz 6-pole induction motor has a full load slip of 3%, the synchronous speed is
      A) 2000 rpm   B) 1000 rpm   C) 100 rpm   D) 10 rpm
   iii) Speed of an induction motor is _____ that of N_S
      A) greater than   B) less than   C) same as   D) double
   iv) The frequency of rotor induced current is given by
      A) $f' = f/s$ B) $f' = sf$ C) $f' = \sqrt{sf}$ D) $f' = 1 - s$.

   b. What is slip in an induction motor? Why slip is never zero in an induction motor. **(04 Marks)**
   c. Derive an expression for frequency of rotor induced emf interms of slip of induction motor. **(06 Marks)**
   d. If a 6-pole induction motor supplied from a 3-phase 50 Hz supply has a rotor frequency of 2.3 Hz. Calculate: i) the percentage slip ii) speed of the rotor. **(06 Marks)**

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