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06ELE15/25

First/Second Semester B.E. Degree Examination, December 2010
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. Select the correct answer:

i) Polarity of voltage drop across a resistor is determined by the _____
A) Value of the resistor B) Value of current through resistor
C) Direction of current through the resistor D) Polarity of voltage source.

ii) If 125V is applied across a 250V, 100 W bulb, the power consumption will be _____
A) 100 W B) 50 W C) 25 W D) 12.5 W

iii) A coil of 1500 turns gives rise to a magnetic flux of 2.5 mWb, when carrying a certain current. If the current is reversed in 0.2 secs, the average emf induced in the coil is _____
A) 18.75 V B) 37.5 V C) 12.5 V D) None of these

iv) The direction of induced emf in a coil is determined by
A) Faraday's law B) Lenz's law C) Fleming's left hand rule D) Ohm's law **(04 Marks)**

b. Derive an expression for the energy stored in an inductor. **(04 Marks)**

c. Define the coefficient of coupling and the coefficient of mutual induction. Write one expression for each. **(04 Marks)**

d. Two batteries are connected as shown in Fig.Q1(d), to a 200V supply. Battery A has an emf of 110V and internal resistance of 0.2 ohm. Battery B has an emf of 100V and internal resistance of 0.25 ohm. Determine the magnitude and direction of the current in each battery and the total current taken from the supply. **(08 Marks)**

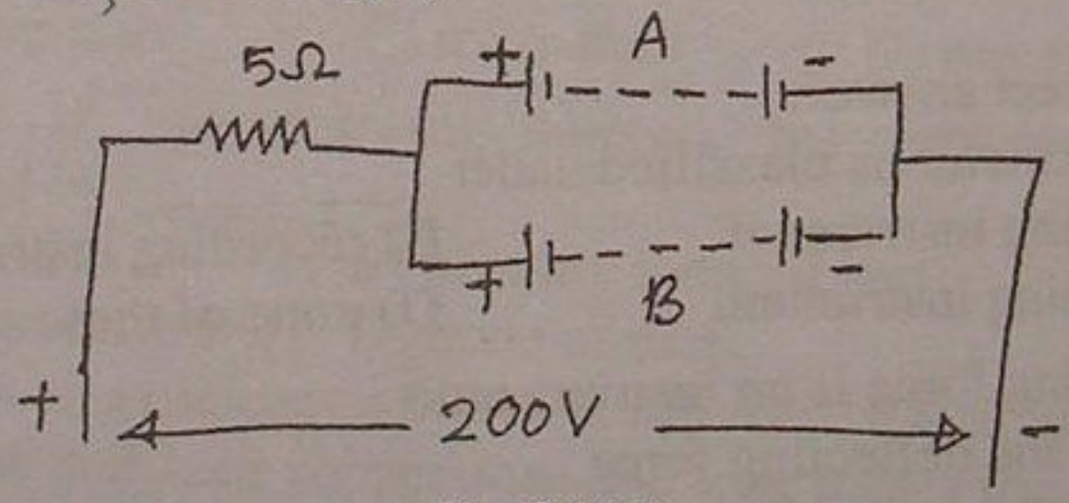

Fig.Q1(d)

2 a. Select the correct answer:

i) The RMS value of a half wave rectified sine wave is
A) 0.707 Em B) 0.5 Em C) 0.637 Em D) 1.11 Em

ii) The real and imaginary part of admittance are called
A) Resistance and reactance B) Conductance and suceptance
C) Conductance and reactance D) Resistance and suceptance

iii) A coil of power factor 0.6 lag is represented as
A) R circuit B) L circuit C) R-L circuit D) R-C circuit

iv) The unit of apparent power is _____.
A) Watts B) Vars C) VA D) Joules **(04 Marks)**

b. With usual notations, prove that power connected in a R-L or R-C series circuit is VIcosθ. **(04 Marks)**

c. A current of 5A flows through a non-inductive resistance, in series with a coil, when supplied at 250V, 50Hz. The voltage across the resistance is 125V and across the coil 200V. Find the resistance and reactance of the coil and the power absorbed by the coil. **(06 Marks)**

d. In the arrangement shown in Fig.Q2(d), calculate the impedance across AB and the phase angle between the voltage and the current. **(06 Marks)**

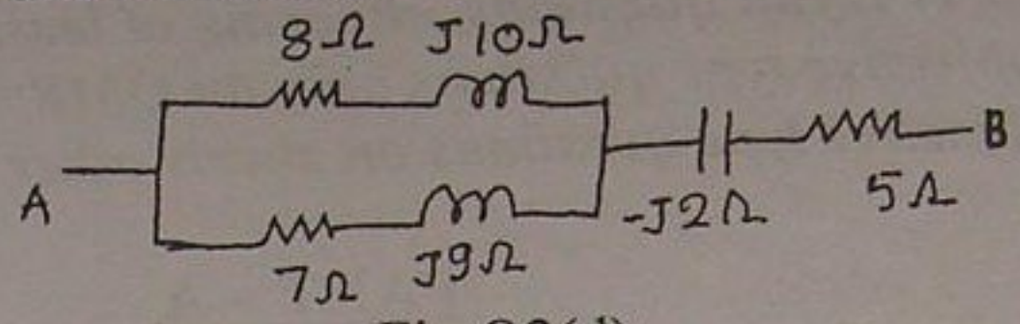

Fig.Q2(d)

3 a. Select the correct answer:

i) The algebraic sum of instantaneous phase voltages in a 3-phase circuit is _____.
A) Three times the phase voltage B) Line voltage
C) Zero D) None of these.

ii) One wattmeter used in a 3-phase circuit shows negative reading when (measurement of power) _____
A) connections are wrong B) the p.f. is less than 0.5
C) the load is resistive D) the phase sequence is reversed.

iii) A balanced delta connected load consumes more power than star connected load (Load/ph is the same) because _____
A) power factors are different B) line current is more
C) delta is a closed path D) none of these.

iv) A 3-phase equipment has a size _____ that of a single phase equipment for the same power capacity.
A) same as B) bigger than C) smaller than D) none of these. **(04 Marks)**

b. "Both the power and the power factor in a 3-phase circuit can be measured using two wattmeters". Prove this giving relevant circuit and vector diagram. **(10 Marks)**

c. A balanced 3-phase star connected load of 150 kW takes a leading current of 100 A, with a line voltage of 1100V, 50Hz. Find the circuit constants of the load per phase. **(06 Marks)**

4 a. Select the correct answer:

i) An energy meter is classified under _____
A) indicating instrument B) recording instrument
C) integrating instrument D) none of these

ii) The damping force is an instrument to _____
A) oppose the deflecting force
B) oppose the controlling force
C) to bring the pointer to steady position quickly
D) to protect the instrument

iii) The earth potential is always taken as _____ for all practical purposes.
A) ∞ B) 0 C) 10 V D) –10 V

iv) A fuse is a _____
A) protective device B) current limiting device
C) voltage limiting device D) unnecessary part of a circuit. **(04 Marks)**

b. With a neat circuit diagram, explain the construction and operation of a dynamometer wattmeter. **(07 Marks)**

c. Give a circuit diagram and switching table for three way control. Where is it used? **(06 Marks)**

d. What is earthing? What are the merits of earthing? **(03 Marks)**

PART – B

5 a. Select the correct answer:

i) The armature of a d.c. machine is made up of laminated sheets in order to _____
A) reduce armature copper loss B) reduce eddy current loss
C) reduce hysteresis loss D) increase the dissipation of heat.

ii) In a d.c. series motor, the torque developed is 20 N.m at 10A. If the current is doubled the new torque will be
A) 60 N.m B) 40 N.m C) 80 N.m D) 100 N.m

iii) Commutator in a dc generator is used for _____
A) converting dc to ac B) changing ac to dc
C) collecting the current from armature D) reducing the friction.

iv) The back emf of dc motor at the moment of starting is _____
A) maximum B) zero C) minimum D) Optimum. **(04 Marks)**

b. Show that speed of a dc motor is directly proportional to the back emf and inversely proportional to the flux/pole. **(04 Marks)**

c. Mention the classification of d.c. generators. **(04 Marks)**

d. A 250V shunt motor on no-load, runs at 1000 rpm and takes 5A. The armature and shunt field resistances are respectively 0.2 ohm and 250 ohm. Calculate the speed of the motor when loaded and taking a current of 50A, if the armature reaction weakens the field by 3%. **(08 Marks)**

6 a. Select the correct answer:

i) An ideal transformer does not change _____.
A) voltage B) power C) current D) None of these.

ii) The copper loss of a certain transformer at half full load is measured as 400 W. Then the copper loss at full load will be
A) 800 W B) 200 W C) 400 W D) 1600 W.

iii) The volts per turn in the primary winding of a transformer is _____ the volts per turn in the secondary.
A) less than B) same as C) more than D) none of these.

iv) When a transformer is operating on no-load, the primary applied voltage is approximately balanced by _____
A) secondary emf induced B) primary induced emf
C) voltage drop in the transformer D) none of these. **(04 Marks)**

b. A 50 kVA transformer has an efficiency of 98% at full load, 0.8 pf and 97% at the half full load, 0.8 pf. Determine the full load copper loss and iron loss. Find the load at which the maximum efficiency occurs. Also, find the maximum efficiency. **(08 Marks)**

c. With usual notations, prove that $E_2 / E_1 = I_1 / I_2 = N_2 / N_1$ for a transformer. **(06 Marks)**

d. Define regulation of a transformer. What is its significance? **(02 Marks)**

7 a. Select the correct answer:

i) Synchronous speed of an IM can be increased by _____
A) reducing the mechanical friction B) increasing the supply voltage
C) increasing the number of poles D) increasing the frequency of supply.

ii) A 4 pole, 50 Hz, induction motor runs at a speed of 1440 rpm. The frequency of rotor current is _____
A) 3 Hz B) 2.5 Hz C) 2 Hz D) 1 Hz.

iii) The roto circuit of a 3-phse induction motor under running condition is _____
A) always closed B) always open
C) sometimes closed and sometimes open D) None of these.

iv) A 50 Hz, 3-phase induction motor under full load has a speed of 720 rpm. Then the number of poles of motor is equal to _____.
A) 2 B) 4 C) 8 D) 16. **(04 Marks)**

b. Explain the working principle of a 3-phase induction motor. Derive the relationship between the frequency of rotor induced emf, and frequency of supply. **(08 Marks)**

c. Explain the process of producing the rotating magnetic field, in a 3-phse induction motor. **(06 Marks)**

d. Why an induction motor needs a starter? **(02 Marks)**

8 a. Select the correct answer:

i) An alternator field structure is normally of _____.
A) stationary type B) revolving type C) vibrating type D) None of these.

ii) Non-salient pole type rotor of an alternator has _____
A) larger diameter and long axial length
B) smaller diameter and long axial length
C) larger diameter and smaller axial length
D) smaller diameter and smaller axial length

iii) Winding factor appears in emf equation of an alternator because _____
A) winding is concentrated
B) coil is full pitched
C) winding is distributed and short pitched
D) winding is accommodated in the stator.

iv) A 4 pole, 50Hz synchronous alternator is made to run at _____
A) 700 rpm B) 1490 rpm C) 1500 rpm D) 3000 rpm. **(04 Marks)**

b. With the help of sketches, explain the different parts of an alternator. Mention their salient features. **(08 Marks)**

c. A 6 pole, 3-phase, star connected alternator has an armature with 90 slots and 10 conductors per slot. It revolves at 1000 rpm. The flux per pole is 0.05 Wb. Calculate the emf generated per phase, if the winding factor is 0.97 and all conductors in each phase are in series. **(08 Marks)**

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