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14ELE15

First Semester B.E. Degree Examination, Dec.2014/Jan.2015
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least ONE full question from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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PART – 1

1 a. Find the values of currents in all the branches of the network shown in Fig. Q1 (a). **(06 Marks)**

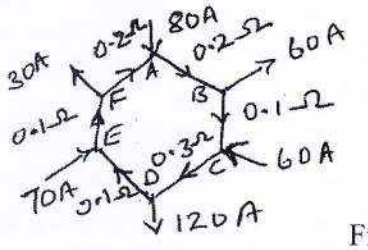

Fig. Q1 (a)

b. A current of 20 A flows through two ammeters A and B in series. The potential difference across A is 0.2 V and across B is 0.3 V. Find how the same current will divide between A and B when they are in parallel. **(06 Marks)**

c. Coils A and B in a magnetic circuit have 600 and 500 turns respectively. A current of 8 A in coil A produces a flux of 0.04 Wb. If co-efficient of coupling is 0.2, calculate
i) Self inductance of coil A with B open circuited.
ii) Flux linking with the coil B.
iii) The average emf induced in coil B when the flux with it changes from zero to full value in 0.02 second.
iv) Mutual inductance. **(08 Marks)**

2 a. A circuit consists of two parallel resistors having resistances of 20 Ω and 30 Ω respectively, connected in series with a 15 Ω resistor. If the current through 30 Ω resistor is 1.2 A, find
(i) Currents in 20 Ω and 15 Ω resistors. (ii) The voltage across the whole circuit.
(iii) Voltage across 15 Ω resistor and 20 Ω resistor. (iv) Total power consumed in the circuit. **(08 Marks)**

b. Obtain the relation between self inductances, mutual inductance and co-efficient of coupling. **(06 Marks)**

c. A coil consists of 600 turns and a current of 10 A in the coil gives rise to a magnetic flux of 1 m. weber. Calculate (i) self inductance (ii) Induced emf and (iii) Energy stored when the current is reversed in 0.01 second. **(06 Marks)**

PART – 2

3 a. Derive the expression for armature torque developed in a d.c. motor. **(06 Marks)**

b. Explain with a neat diagram, the constructional features and operation of an induction type single phase energy meter. **(06 Marks)**

c. A 30 kW, 300 V DC shunt generator has armature and field resistances of 0.05 ohm and 100 ohm respectively. Calculate the total power developed by the armature when it delivers full output power. **(08 Marks)**

4 a. Derive the emf equation for a dc generator. **(06 Marks)**

b. With a neat diagram explain the construction and working of dynamometer type wattmeter. **(06 Marks)**

c. A 200 V lap wound dc shuntmotor has 800 conductors on its armature. The resistance of the armature winding is 0.5 Ω and that of field winding is 200 Ω. The motor takes a current of 21 A, the flux per pole is 30 mwb. Find the speed and torque developed in the motor. **(08 Marks)**

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PART – 3

5 a. Obtain expression for the current through the pure inductor, if the voltage across it is $v = v_m \sin \omega t$. **(06 Marks)**

b. A voltage $v = 100 \sin 314t$ is applied to a circuit consisting of a 25 ohm resistor and an 80 μF capacitor in series. Determine (i) peak value of current (ii) power factor (iii) Total power consumed by the circuit. **(08 Marks)**

c. Write a short note on:
(i) Necessity of earthing.
(ii) Precautions to be taken to prevent electric shock. **(06 Marks)**

6 a. A voltage of 200 V is applied to a series circuit consisting of a resistor, an inductor and a capacitor. The respective voltages across these components are 170 V, 150 V and 100 V and the current is 4 A. Find (i) the power factor (ii) Resistance (iii) Impedance (iv) Inductive reactance and capacitive reactance. **(08 Marks)**

b. Explain the necessity and the operation of earth leakage circuit breaker. **(06 Marks)**

c. Two impedances $z_1 = (6 - j8)$ ohms and $z_2 = (16 + j12)$ ohms are connected in parallel. If the total current of the combination is $(20 + j10)$ amperes, find
(i) Voltage across the combination.
(ii) Currents in the two branches. **(06 Marks)**

PART – 4

7 a. Obtain the relationship between line and phase, voltages and currents in a three phase balanced star connected system. **(06 Marks)**

b. A 3-phase delta connected balanced load consumes a power of 60 k.w. taking a lagging current of 200 A at a line voltage of 400 V, 50 Hz. Find the parameters of each phase. **(06 Marks)**

c. A 12 pole 500 rpm star connected alternator has 48 slots with 15 conductors per slot. The flux per pole is 0.02 webers. The winding factor is 0.97 and pitch factor is 0.98. Calculate the phase emf and line emf. **(08 Marks)**

8 a. Define phase sequence and list out the advantages of three phase system as compared to single phase system. **(06 Marks)**

b. A 4-pole 1500 rpm star connected alternator has 9 slots / pole and 8 conductors per slot. Determine the flux per pole to give a terminal voltage of 3300 V. Take winding factor and pitch factor as unity. **(08 Marks)**

c. The input power to a 3-phase induction motor running on 400 V, 50 Hz supply was measured by two wattmeter method and readings were 3000 W and -1000 W. Calculate (i) Total power input (ii) Power factor (iii) Line current. **(06 Marks)**

PART – 5

9 a. Derive emf equation of a transformer. **(06 Marks)**

b. In a 25 KVA, 2000/200 V single phase transformer, the iron and full load copper losses are 350 watts and 400 watts respectively. Calculate the efficiency at unity power factor on (i) full load (ii) half full load. **(08 Marks)**

c. An 8-pole alternator runs at 750 rpm and supplies power to a 6-pole induction motor which runs at 970 rpm. What is the slip of the induction motor? **(06 Marks)**

10 a. A 600 KVA transformer has an efficiency of 92% at full load, unity p.f. and half full load, 0.9 p.f. Determine its efficiency at 75% of full load, 0.9 p.f. **(08 Marks)**

b. An 8-pole alternator runs at 750 rpm and supplies power to a 4-pole induction motor. The frequency of rotor current is 1.5 Hz. Determine the speed of the motor. **(06 Marks)**

c. Derive the condition for which the efficiency of a transformer is maximum. **(06 Marks)**

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