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14ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting ONE full question from each module.***

Module – 1

1 a. State and explain Kirchhoff's laws with example. **(06 Marks)**

b. In the given circuit shown in Fig Q1(b) : find the currents flowing in the various branches of the circuit. **(06 Marks)**

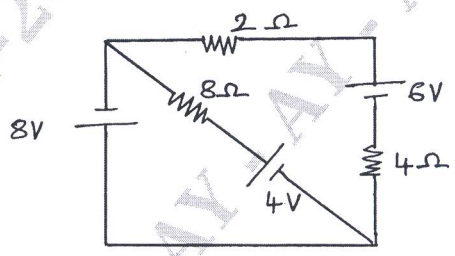

Fig Q1(b)

c. Two identical coils of 1800 turns each, are placed side by side such that, 65% of the flux produced by one coil links the other. A current of 5A in the first coil sets up a flux of 0.12 mwb. If the current in the first coil changes from +5A to −5A, in 25mesc, find:
(i) the self inductance of the coils (ii) The emf's induced in both the coils. **(08 Marks)**

2 a. Derive an expression for the energy stored in an inductive coil. **(06 Marks)**

b. Two voltmeters of resistances 15kΩ and 20kΩ are connected in series across 200V supply. Both meters are 0-300V range. Find the readings of the voltmeter. **(04 Marks)**

c. Calculate the approximate resistance and inductance of an air cored solenoid, 100cm long and 1cm in diameter. The coil is made of copper wire having 2000 turns, a resistivity of 1.73×10^{-2} μΩ-m and a diameter of 1mm. Find the potential difference between the terminals of the solenoid, when a current of 2A is changing at the rate of 12,000A/sec. **(07 Marks)**

d. Find the resistance across SM of the network shown in Fig Q2(d). **(03 Marks)**

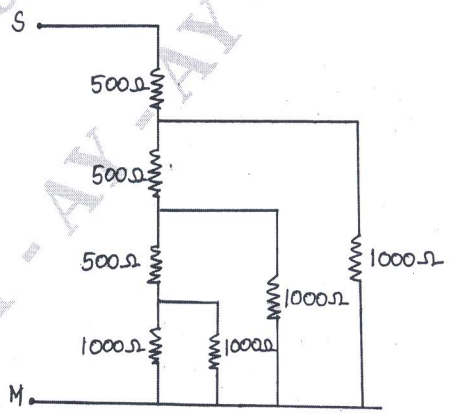

Fig Q2(d)

Module – 2

3 a. Derive the emf equation of a DC generator. **(06 Marks)**

b. Explain with a neat diagram, the constructional features and operation of dynamometer type wattmeter. **(06 Marks)**

c. Explain the working principle of operation of DC motor. **(06 Marks)**

d. Mention different types of armature windings and write one analogy between them. **(02 Marks)**

4 a. The armature of an 8 pole D.C generator has 960 conductors and runs at 400rpm. The flux per pole is 40mwb. Calculate the induced emf when the armature is lap wound. At what speed should it be driven to generate 400V, if the armature is wave connected. **(06 Marks)**

b. Sketch and explain the various characteristics of DC shunt motor and mention its applications. **(08 Marks)**

c. The field current in a DC shunt machine is 2A and the line current is 20A at 200V. Calculate (i) the generated emf when working as generator (ii) torque in N-m when running at 1500 rpm as motor. Take the armature resistance as 0.5Ω **(06 Marks)**

Module – 3

5 a. Define RMS value of an alternating quantity. Obtain the relation between rms value and the maximum value of an alternating quantity. **(05 Marks)**

b. With the help of neat sketch explain two way and three way control of lamps. **(06 Marks)**

c. A single phase voltage of 220V at 50Hz is applied to a circuit comprising of a resistance of 20Ω, inductance of 20mH and a capacitance of 150μF connected in series. Find : (i) Impedance of the circuit (ii) Current drawn (iii) Power factor (iv) Power (v) Draw phasor diagram. **(09 Marks)**

6 a. Write a note on : (i) Electric shock (ii) Miniature Circuit Breaker (MCB). **(06 Marks)**

b. For a R-L-C series circuit discuss the nature of the p.f for (i) $X_L > X_C$ (ii) $X_L < X_C$ (iii) $X_L = X_c$ with the help of phasor diagram. **(06 Marks)**

c. Two circuits A and B are connected in parallel across 200V, 50Hz supply. Circuit A consists of 10Ω resistance and 0.12H inductance in series while circuit B consists of 20Ω resistance in series with 40μF capacitance. Calculate: (i) Current in circuit A and Circuit B (ii) Total current (iii) Total power. **(08 Marks)**

Module – 4

7 a. Obtain the relationship between line and phase voltage and current in a three phase balanced star connected system, with the help of neat vector diagram. **(08 Marks)**

b. State the advantages of rotating field over rotating armature in case of alternators. **(06 Marks)**

c. A 3 phase, 500 rpm, 6 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. Calculate, the flux/pole required to generate a line voltage of 2300V. Assume pitch factor $K_c = 0.956$ and distribution factor $K_d = 0.952$. **(06 Marks)**

8 a. Show that two wattmeters are sufficient to measure three phase power for a $3 - \phi$ balanced circuit. **(06 Marks)**

b. A balanced three phase star connected load draws power from 440V supply. The two wattmeters connected indicate $W_1 = 750$ Watts and $W_2 = 1.5$KW. Calculate power, power factor and current in the circuit. If the W_1 wattmeter is reversed, what would be the phase angle between voltage and current? **(08 Marks)**

c. Explain construction of alternator with their main functions of the different parts and write working principle too in brief. **(06 Marks)**

Module – 5

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

b. A single phase transformer working at 0.8 p.f. has an efficiency of 94% at both three fourth full load and full load of 600kW. Determine the efficiency at half full load, UPF. **(06 Marks)**

c. Prove that a rotating magnetic field of constant magnitude is produced when the stator windings of polyphase induction motor are energized by a balanced three phase supply. **(08 Marks)**

10 a. Define efficiency of a transformer. Obtain the expression for efficiency at different loads and deduce the condition for maximum efficiency. **(08 Marks)**

b. A 8 pole alternator runs at 750 rpm supplies power to 4 pole induction motor. The frequency of rotor is 1.5 Hz. What is the speed of the motor and slip of motor? **(06 Marks)**

c. Explain why an induction motor needs starter. **(03 Marks)**

d. What are the applications of three phase induction motor? **(03 Marks)**

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