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14ELE15/25

First/Second Semester B.E. Degree Examination, Jan./Feb. 2021
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. State and Explain Ohm's law? Mention its limitations. **(04 Marks)**

b. Define coefficient of coupling and establish a relation between self inductance and mutual inductance with coefficient of coupling. **(06 Marks)**

c. Two identical 1000 terns each coils X and Y lie in parallel planes such that 60% of the magnetic flux produced by one coil links the other. A current of 5A in X products in it a flux of 0.05 mwbs. If the current in X changes from +6A to –6A in 0.01sec, what will be the magnitude of the emf induced in Y? Calculate the self inductance of each coil and the mutual inductance. **(05 Marks)**

d. A resistance R is connected in series with a parallel circuit comprising two resistances of 12Ω and 8Ω respectively. The total power dissipated in the circuit is 70W when the applied voltage is 20V. Calculate R. **(05 Marks)**

OR

2 a. State Fleming's Right hand and Left hand rules and mention their applications. **(05 Marks)**

b. Derive an expression for the energy stored in an induction. **(05 Marks)**

c. Two resistances are connected in parallel across a 200V DC supply and total current drawn is 25A. The power dissipated in one of the resistor is 1500W. Calculate the resistance of each resistor. **(05 Marks)**

d. What is the differences of potential between the points X and Y in the network shown in Fig Q2(d)

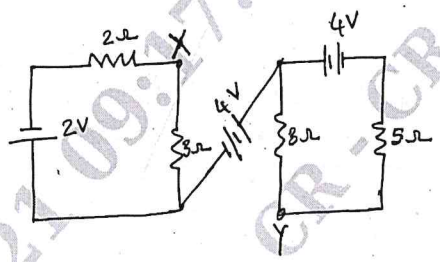

Fig Q2(d) **(05 Marks)**

Module-2

3 a. Draw the cross sectional views of a dc machine and explain the construction. **(06 Marks)**

b. What are the Lap and wave windings? How do they differ with each other? Establish the relation between generated emf, terminal voltage and the brash drop in a series generator. **(04 Marks)**

c. With a neat diagram, explain the construction and operation of an induction types of single phase energy meter. **(06 Marks)**

d. A shunt generator has an induced voltage on open circuit of 127V. When the machine is on load the terminal voltage in 120V. Find the load current if the armature resistance be 0.02Ω and field resistance be 15Ω. Ignore armature reaction. **(04 Marks)**

OR

4 a. What is Back Emf in a DC motor? Mention its significance. **(04 Marks)**

b. Draw the torque – load and speed – load characteristics of dc series and shunt motors and mention their applications. **(06 Marks)**

c. Explain the necessity of starter for a DC motor. **(04 Marks)**

d. A 100kW belt driver shunt generator running at 300rpm on 220V bus bars continuous to run as a motor when the belt breaks, then taking 10kW. What will be its speed? $R_a = 0.025\Omega$, $R_{sh} = 60\Omega$. Contact drop under each = 1V, ignore Arm reaction. **(06 Marks)**

Module-3

5 a. Show that the Form factor and the peak factor of a sinusoidally varying alternating quantity in constant at 1.11 and 1.414 respectively. **(08 Marks)**

b. An inductive coil draws a current of 2A when connected to a 230V, 50Hz supply the power taken by the coil is 100W. Calculate resistance and inductance of the coil. **(06 Marks)**

c. Show that the power in a R-L series circuit is given by $P = VI \cos \phi$. **(06 Marks)**

OR

6 a. Obtain the RMS value of sinusoidally varying alternating quantity. **(04 Marks)**

b. Show that the powder consumed by a pure induction over a complete cycle is zero. Draw the wave forms. **(06 Marks)**

c. An emf whose instantaneous value is 100 sin (314t - π/4)v is applied to a circuit and the current following through it is 20 sin (314t – 1.5 708)A. Find the frequency and the values of the circuit elements. **(05 Marks)**

d. With a neat diagram and truth table explain the controlling of lamp by 3 way method. **(05 Marks)**

Module-4

7 a. Enumerate the advantages of 3-phase system over 1–phase system. **(04 Marks)**

b. Obtain the relationship between the phase and line values of the current is a balance delta connected system. **(06 Marks)**

c. Each of the 2 wattmetrs connected to measure the input to a 3-phase circuit readers 20KW, what does each instrument reads when the load power factor is 0.866 lagging with the total 3-phase power remaining unchanged in the altered condition. **(06 Marks)**

d. With neat diagram explain the construction of a salient pole alternator. **(04 Marks)**

OR

8 a. Show that in a 3-phase, balanced Y connected circuit only 2 wattmeters are sufficient to measure the total 3-phase power and power factor of the circuit. **(10 Marks)**

b. Derive the EMF equation of a synchronous generator. **(05 Marks)**

c. Find the number of armature conductors in series/pH required for the armature of a 3 phase, 50Hz, 10 pole alternators with 90 slots. The winding to be star connected to give a line voltage of 11000V. The flux/pole is about 0.16 wbs. **(05 Marks)**

Module-5

9 a. Explain the necessity of transformers. **(04 Marks)**

b. In what way does the core type transformer differ in construction from shell type? With figures compare the magnetic circuits of the two. **(06 Marks)**

c. What are the losses that occur in a transformer? How do they vary with the load? How are they minimized? **(05 Marks)**

d. Explain why an induction motor cannot run at synchronous speed. **(05 Marks)**

OR

10 a. Explain with diagrams the construction of squirrel cage and phase wound induction motors. **(06 Marks)**

b. Why are starters necessary for all induction motor? With a neat diagram explain star-delta starter. **(08 Marks)**

c. A 50 KVA transformer has an efficiency of 98% at full load, 0.8 power factor and an efficiency of 96.9% at quarter full load, upf. Determine its iron loss and full load copper loss. **(06 Marks)**