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18ELE13/23

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022
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 Kirchhaff's laws and ohm's law. **(06 Marks)**

b. Find :
i) Voltage drop across 4 Ω
ii) Supply voltage for the networks shown in Fig.Q1(b).

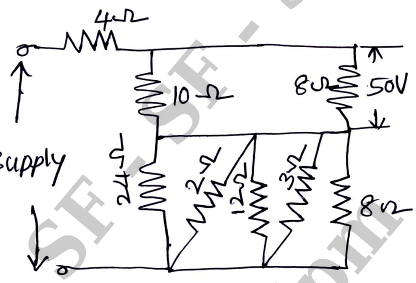

Fig.Q1(b) **(08 Marks)**

c. Define the following :
i) Average value of alternating current ii) Form factor iii) Peak factor. **(06 Marks)**

OR

2 a. Two resistance 20Ω and 40Ω are connected in parallel. A resistance of 10Ω is connected in series with the combination. A voltage of 200V is applied across the circuit. Find the current in each resistance and voltage across 10Ω. Find also the power consumed in all the resistors. **(08 Marks)**

b. Derive the expression for RMS value average current of a sinusoidally varying quantity. **(08 Marks)**

c. Two alternating currents in a parallel circuit are represented by $i_1 = 5\sin\omega t$ and $i_2 = 10\sin(\omega t + 60°)$. Find the resultant current. **(04 Marks)**

Module-2

3 a. Show that a pure inductance does not consume any power draw the waveforms of voltage, current, power when an alternating voltage is applied to pure inductance. **(08 Marks)**

b. A coil of resistance 10Ω and inductance 0.1H is connected in series with a 150μF capacitor across a 200V, 50Hz supply. Calculate :
i) Inductive reactance
ii) Capacitive reactance
iii) Impedance
iv) Current
v) Power factor
vi) Voltage across coil
vii) Voltage across capacitor. **(08 Marks)**

c. An inductive coil takes a current of 33.24a from 230V, 50Hz supply, if the resistance of coil is 6Ω. Calculate inductance of the coil and power taken by the coil. **(04 Marks)**

OR

4 a. In a three phase star connection, show that $V_L = \sqrt{3}V_{ph}$ also draw vector diagram of line voltage and phase voltage. **(07 Marks)**

b. What are the advantages and three phase system over a single phase system? **(07 Marks)**

c. A delta connected load consist of a resistance of 10Ω and capacitance of 100μF in each phase. A supply of 410V at 50Hz a applied to the load. Find line current, power consumed by the load and power factor. **(06 Marks)**

Module-3

5 a. Derive the EMF equation of a transformer. **(06 Marks)**

b. A single phase transformer working at 0.8 power factor has an efficiency at 94% at both ¾ full load and pull load of 600KW. Find the efficiency at ½ full load unity power factor. **(08 Marks)**

c. Primary winding of a transformer is connected to a 240V, 50Hz. The secondary winding has 1500 turns and the maximum value of core flux is 0.00207 ωb. Find secondary induced emf, number of turns in primary and cross sectional area of core. If max value of flux density is 0.465 Tesla. **(06 Marks)**

OR

6 a. Explain plate Earthing. **(06 Marks)**

b. With circuit diagram and switching table, explain two-way control of lamp. **(08 Marks)**

c. What are the precaution to be taken against electric shock? **(06 Marks)**

Module-4

7 a. Draw a neat sketch of DC machine and name the parts and briefly explain the function of each. **(10 Marks)**

b. A 4-pole, 220V, Lap connected DC shunt motor has 36 slots, each slot containing 16 conductors, it draws a current of 40A from the supply. The field resistance and armature resistance are 110Ω and 0.1Ω respectively. The motor develops an output power of 6KW. Flux per pole is 40MWb. Calculate : i) speed ii) torque developed by the armature iii) shaft torque. **(10 Marks)**

OR

8 a. EMF generated in the armature of a shunt generator is 625V. When delivering its full current of 400A to an external circuit. The field current is 6A and armature resistance is 0.06Ω. What is the terminal voltage? **(06 Marks)**

b. Sketch the various characteristic of DC motor (shunt). **(08 Marks)**

c. What is the significance of back EMF in a DC motor? **(06 Marks)**

Module-5

9 a. Derive the EMF equation of an alternator. **(06 Marks)**

b. 4-pole, 1500rpm, star connected alternator has 9 slot/pole, and 8 conductor per slot. Find the flux per pole to give a terminal voltage of 3300V. Take the winding factor as unity. **(07 Marks)**

c. A 6 pole, star connected alternator has a 90 slot and 8 conductor per slot, and rotates at 1000rpm. The flux per pole is 50 mwb. Find the induced emf across its lines. Take the winding factor of 0.97. **(07 Marks)**

OR

10 a. Mention the advantages and disadvantages of a squirrel cage and slip ring induction motors. **(07 Marks)**

b. Why starter is required for a three phase induction motor? **(07 Marks)**

c. A 6 pole induction motor is supplied by a 10 pole alternator. Which is driven at 600rpm. If the motor is running at 970rpm, find the slip. **(06 Marks)**