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21ELE13

First Semester B.E./B.Tech. 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 Kirchoff's law for DC circuits. Illustrate with an example. **(08 Marks)**

b. What is the voltage across A and B in the circuit shown in Fig.Q.1(b). **(06 Marks)**

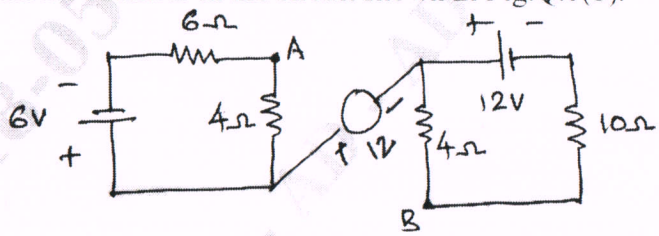

Fig.Q.1(b)

c. Define the following terms:
   i) Average value
   ii) RMS value
   iii) Form factor. **(06 Marks)**

OR

2 a. Prove that the maximum power will be transferred to the load when load resistance is equal to the source resistance. **(06 Marks)**

b. A pure inductor excited by sinusoidal varying AC voltage, show that the average power consumed by inductor is zero. **(08 Marks)**

c. A 318μF capacitor is connected across a 230V, 50Hz system. Determine: i) Capacitive reactance ii) RMS value of current iii) Extrusions for instantaneous voltage and current v(t) and i(t). **(06 Marks)**

Module-2

3 a. Define: i) Real power ii) Reactive power iii) Power factor. **(06 Marks)**

b. A series circuit with R = 10Ω, L = 50mH and C = 100μF is supplied with 200V, 50Hz. Find: i) The impedance ii) Current iii) Power iv) Power factor. **(08 Marks)**

c. Deduce the relationship between the phase and the line voltages of a three phase star connected system. **(06 Marks)**

OR

4 a. Deduce the relationship between the phase and the line current of a three phase delta connected system. **(06 Marks)**

b. A balanced star connected load of (8 + j6)Ω per phase is connected to a three phase 230V supply. Find the current, power factor, power, reactive volt ampere and total voltampere. **(05 Marks)**

c. Three phase power consumed by the balanced load is given by $P = \sqrt{3}\ V_L\ I_L \cos\phi$ watts. then show that two wattmeter is sufficient to measure three phase power P. **(09 Marks)**

Module-3

5 a. With neat sketch, explain the different parts of a DC generators. **(06 Marks)**

b. Give the classification of DC generator. Obtain the expression for EMf equation of a DC generator. **(08 Marks)**

c. Give broad classification of transformers. Explain the construction of transformer. **(06 Marks)**

OR

6 a. Derive the expression for emf induced in the primary or secondary side of a transformer. **(06 Marks)**

b. Derive an expression for the torque developed by a DC motor. **(06 Marks)**

c. A 250KVA, 11000/415V, 50Hz single phase transformer has 80 turns on the secondary, calculate:

i) Rated primary and secondary currents.

ii) Number of primary turns.

iii) Maximum value of core flux.

iv) Voltage induced per turn. **(08 Marks)**

Module-4

7 a. Explain the concept of rotating magnetic field in case of stator field a 3-phase induction machine with a neat diagram. **(08 Marks)**

b. Define slip of an induction motor and derive expression for the frequency of rotor currents. **(06 Marks)**

c. Describe the main parts of synchronous generator with neat sketches. **(06 Marks)**

OR

8 a. A 3 phase induction motor with 4 poles is supplied from an alternator having 6 poles and running at 1000rpm. Calculate synchronous speed of the induction motor, its speed when slip is 0.04 and frequency of the rotor emf when speed is 600rpm. **(08 Marks)**

b. Derive the emf equation of a synchronous generator. **(06 Marks)**

c. A 24 pole turbo alternator has a star connected armature winding with 144 slots and 10 conductors per slot. It is driven by a low speed Kaplan turbine at a speed of 250rpm. The winding has full pitched coils with a distribution factor of 0.966. The flux per pole is 67.3mWb. Determine: i) Frequency and magnitude of the line voltage ii) Output KVA of the machine if the total current in each phase is 50A. **(06 Marks)**

Module-5

9 a. What is electric power supply system? Draw a single line diagram of a typical a.c supply scheme. **(06 Marks)**

b. What is the necessity of earthing? Explain plate earthing. **(08 Marks)**

c. Explain the working principle of fuse and MCB. **(06 Marks)**

OR

10 a. Explain components of low voltage distribution system with neat sketches. **(06 Marks)**

b. A consumer uses a 10kW geezer, a 6kW electric furnace and five 100W bulbs for 8 hours. How many units of electrical energy have been used? Define an electrical energy unit. **(06 Marks)**

c. What do you mean by electric shock? Write a short note on precautions against an electric shock. **(08 Marks)**

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