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First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020 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 Ohm's Law. Mention its limitations. (06 Marks)
- b. Find E_1 , E_2 and I when the power dissipated in the 5Ω resistor is $125W$.(Ref. Fig.Q1(b)). (07 Marks)

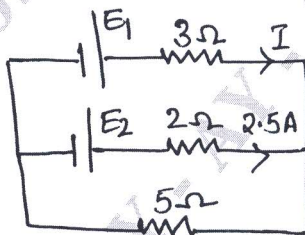


Fig.Q1(b)

- c. Define RMS value of alternating current, show that its value is proportional to maximum value. (07 Marks)

OR

- 2 a. Two 12V batteries with internal resistances 0.2Ω and 0.25Ω respectively are joined in parallel and a resistance of 1Ω is placed across the terminals. Find the current supplied by each battery. (07 Marks)
- b. The equation for an AC voltage is given as $V = 0.04\sin(2000t + 60^\circ)V$. Determine the frequency, the angular frequency, instantaneous voltage when $t = 160\mu s$. What is the time represented by a 60° phase angle. (06 Marks)
- c. Explain the generation of 1ϕ AC induced emf with suitable diagram. (07 Marks)

Module-2

- 3 a. Show that in a pure inductor the current lags behind the voltage by 90° . Also draw the voltage and current waveforms. (06 Marks)
- b. Given $V = 200 \sin 377$ volts and $i = 8 \sin(377t - 30^\circ)$ Amps for an AC circuit, determine :
i) Power factor ii) True power iii) Apparent power iv) Reactive power indicate the unit of power calculated. (08 Marks)
- c. 3 similar coils each having resistance of 10Ω and reactance of 8Ω are connected in star across 400V, 3ϕ supply. Determine : i) Line current ii) Total power iii) Reading of each of the two wattmeters connected to measure power. (06 Marks)

OR

- 4 a. Show that the power in a balanced 3ϕ star connected circuit can be measured by 2 Wattmeter. Draw the circuit and vector diagram. (08 Marks)
- b. Three coils each of impedance $20\angle 60^\circ\Omega$ are connected in star to 3ϕ 400V, 50Hz supply. Find the reading on each of the 2 wattmeters connected to measure the power input. (08 Marks)
- c. What is meant by power factor in AC circuits? What is its significance in AC circuits? (04 Marks)

Module-3

- 5 a. Derive an emf equation of transformer with usual notation. (06 Marks)
 b. Explain the 2 way control and 3 way control of lamp with suitable circuit diagram and working table. (06 Marks)
 c. A 40KVA, 1 ϕ transformer has core loss of 450W and full load copper loss 850Watts. If the power factor of the load is 0.8. Calculate :
 i) Full load efficiency
 ii) Maximum efficiency at UPF
 iii) Load for maximum efficiency. (08 Marks)

OR

- 6 a. List different types of loss in a transformer and explain each one in brief. (06 Marks)
 b. What is Earthing? Why earthing is required? With the help of sketch explain plate earthing. (08 Marks)
 c. Write a short note :
 i) MCB
 ii) Precautions against electric shock. (06 Marks)

Module-4

- 7 a. With a neat sketch, explain the construction of the various parts of DC generator. (08 Marks)
 b. Explain the significance of back emf in a DC motor. (06 Marks)
 c. A shunt wound DC generator delivers 496A at 440V to load. The resistance of the shunt field coil is 110 Ω and that of armature winding is 0.02 Ω . Calculate the emf induced in the armature. (06 Marks)

OR

- 8 a. Derive the torque equation of DC motor with usual notations. (06 Marks)
 b. A 6 pole lap-connected DC series motor, with 864 conductors, takes a current of 110A at 480V. The armature resistance and the series field resistance are 0.18 Ω and 0.02 Ω respectively. The flux per pole is 50mwb. Calculate :
 i) The speed ii) The gross torque. (07 Marks)
 c. Derive emf equation of a DC generator. (07 Marks)

Module-5

- 9 a. Derive the emf equation of synchronous generator. (06 Marks)
 b. With a circuit diagram, explain the working of star-delta starter for a 3 ϕ induction motor. (07 Marks)
 c. A 12 pole, 3 ϕ alternator is coupled to an engine running at 500rpm. It supplies an induction motor which has a full load speed of 1440rpm. Find the percentage slip and the number of poles of the motor. (07 Marks)

OR

- 10 a. Explain the concept of rotating magnetic field and show that resultant flux remains same at different instants of time. (07 Marks)
 b. A 3 ϕ , 50Hz, 20pole, salient pole alternator with Y-connected stator winding has 180 slots on the stator. There are 8 conductors per slot and the coils are full-pitched. The flux per pole is 25mwb. Assuming sinusoidally distributed flux, calculate :
 i) Speed ii) Generated emf per phase iii) Line emf. (07 Marks)
 c. Describe the constructional features of synchronous generator with suitable diagram. (06 Marks)

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