

CBCS SCHEME

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17ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2023 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. Explain Ohm's law. List the characteristics of parallel circuit. (06 Marks)
b. For the circuit shown in Fig.Q1(b), find current in the battery, the current in each branch and potential difference across AB.

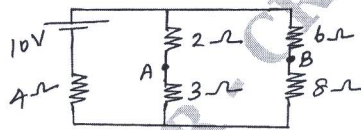


Fig.Q1(b)

(08 Marks)

- c. Two coupled coils of self inductances 0.8H and 0.20H have a co-efficient of coupling 0.9. Find the mutual inductance and turns ratio. (06 Marks)

OR

- 2 a. Explain Kirchoff's laws. (06 Marks)
b. For the circuit shown in Fig.Q2(b), find the current supplied by each battery and power dissipated in 1 Ω resistor.

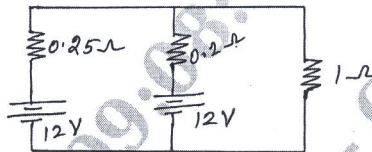


Fig.Q2(b)

(08 Marks)

- c. Develop an expression for the energy stored in a magnetic field. (06 Marks)

Module-2

- 3 a. With neat sketch explain the construction of a dc machine. (06 Marks)
b. A 4 pole dc shunt motor takes 22 Amps from 220V supply. The armature and field resistances are 0.5 Ω and 100 Ω respectively. The armature is lap connected with 300 conductors. If the flux per pole is 20 mwb, find the speed and gross torque. (06 Marks)
c. With the help of neat diagrams, explain the construction and principle of operation of dynamometer type wattmeter. (08 Marks)

OR

- 4 a. With usual notations, develop the emf equation of a dc generator. (06 Marks)
b. A 220V series motor is taking a current of 40 Amps. The resistance of armature is 0.5 Ω and the resistance of series field is 0.25 Ω. Determine the voltage at the brushes and back emf. (06 Marks)
c. With the help of neat diagram, explain the construction and principle of operation of single phase induction type energy meter. (08 Marks)

Module-3

- 5 a. Define root mean square value of an alternating quantity. Discuss the relation between root mean square value and the maximum value of an alternating quantity. (06 Marks)
- b. An alternating current of frequency 60 Hz has a maximum value of 12 Amps. Construct the equation for instantaneous values. Find the value of the current after $1/360$ second. Also find the time taken to reach 9.6 Amps for the first time. In the above cases assume that the time is reckoned as zero when current wave is passing through zero and increasing in the positive direction. (06 Marks)
- c. With neat diagrams, explain two way control of lamp. (08 Marks)

OR

- 6 a. Define average value of an alternating Quantity. Discuss the relation between average value and the maximum value of an alternating Quantity. (06 Marks)
- b. The equation of an alternating current is given by $i = 42.42 \sin 628t$. Find its maximum value, frequency, RMS value, average value and form factor. (05 Marks)
- c. With a neat sketch, discuss the operation of Residual current circuit breaker. (09 Marks)

Module-4

- 7 a. A three phase, star connected supply with a phase voltage of 230V is supplying a balanced delta load. The load draws 15 kW at 0.8 p.f. lagging. Find the line currents and the current in each phase of the load. What is the load impedance per phase? (06 Marks)
- b. A balanced three phase star connected load draws power from 440V supply. The two wattmeters connected indicate $W_1 = 5$ kW and $W_2 = 1.2$ kW. Evaluate power, current and power factor in the circuit. (06 Marks)
- c. Discuss the different types of rotors used in the three phase synchronous generators. (08 Marks)

OR

- 8 a. A balanced star connected load of $(8 + j6)\Omega$ per phase is connected to a three phase, 230V supply. Find the line current, power factor and power. (06 Marks)
- b. Power is measured in a three phase balanced load using two wattmeters. The line voltage is 400V. The load and its power factor is so adjusted that the line current is always 10 Amps. Find the reading of the wattmeters when the power factor is unity and 0.866. (06 Marks)
- c. A 12 pole, 500rpm, star connected synchronous generator has 48 slots with 15 conductors per slot. The flux per pole is 0.02 wbs and is distributed sinusoidally. The winding factor is 0.97 and the pith factor is 0.98. Estimate the line emf. (08 Marks)

Module-5

- 9 a. Define a transformer. Explain the principle of operation of single phase transformer. (06 Marks)
- b. Explain the various losses in a transformer and how to minimize them. (06 Marks)
- c. Discuss the important features of squirrel cage and phase wound rotor constructions in an induction motor. (08 Marks)

OR

- 10 a. Develop the emf equation of a transformer. (06 Marks)
- b. Analyse the condition for the maximum efficiency for a transformer. (06 Marks)
- c. With a neat circuit diagram explain star delta starter for a three phase induction motor. (08 Marks)
