CBCS SCHEME

USN | | | | | | | | | | |

18ELE13/23

First/Second Semester B.E. Degree Examination, June/July 2025
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

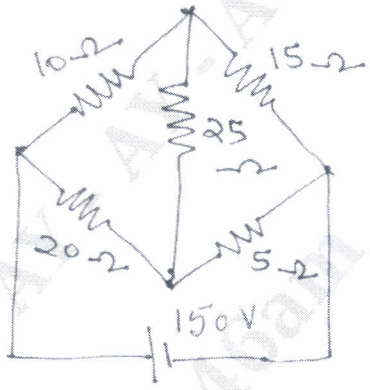
Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume any suitable missing data.

Module-1

1 a. Define the basic laws that are used to study electrical circuits. Give examples. **(08 Marks)**

b. With a neat diagram explain the principle of generation of AC voltage. **(06 Marks)**

c. Find the current in all the resistors as shown in the figure below.



(06 Marks)

Fig.Q.1(c)

OR

2 a. Derive equations for equivalent resistance connected in
i) Series
ii) Parallel (use 3 resistors R_1 R_2 R_3) **(06 Marks)**

b. With explanation derive the equation for rms value of an AC current. **(08 Marks)**

c. An alternating current of frequency 60 HZ has a maximum value of 12A.
i) Write the equation for instantaneous value
ii) Value of the current at $\frac{1}{360}$ secs
iii) Time taken to reach a value of 9.6A. **(06 Marks)**

Module-2

3 a. Derive the equation for power consumed in a series RC circuit. Draw the relevant phasor diagram and waveforms. **(08 Marks)**

b. A voltage of 125 v at 60Hz is applied across a mass inductive resistor connected in series with a capacitor. The current shown is 2.2A. The power loss in the resistor is 96.8 watts and across the capacitor is nil. Calculate the value of resistances and capacitance. **(06 Marks)**

c. For a Δ connected 3 phase system derive the relation between live and phase current. **(06 Marks)**

OR

4 a. In a pure capacitive circuit, show that power consumed is zero, using relevant equations. **(06 Marks)**

b. Show that two wattmeter are sufficient to measure 3ϕ power for balanced star connected load. **(08 Marks)**

c. Two wattmeter are connected to measure the input of a 15HP, 50Hz 3ϕ induction motor at full load. The full load efficiency and power factor are 0.9 and 0.8 lag respectively. Find the reading of the 2 wattmeters. **(06 Marks)**

Module-3

5 a. Classify the transformers depending on
i) Voltage
ii) Construction. Draw the required diagram. **(08 Marks)**

b. What is earthing? Explain pipe earthing. **(06 Marks)**

c. Derive the emf equation of a single phase transformer. **(06Marks)**

OR

6 a. Explain 3 way control of lamp. **(06 Marks)**

b. A single phase transformer has a power factor of 0.8 and an efficiency of 94% at $\frac{3}{4}$ full load and full load. Full load output is 600 KW. Determine efficiency at Y_2 FL units power factor. **(08 Marks)**

c. Write a note on different losses that occurring in a single phase transformer. **(06 Marks)**

Module-4

7 a. Derive the emf equation of DC generator. Write the equation for the terminal voltage, for d.c. shunt generator considering voltage drop. **(10 Marks)**

b. Derive the Torque equation of a DC motor. **(10 Marks)**

OR

8 a. With relevant circuit diagram derive the back emf equation for DC series and DC shunt motor. Mention the voltage drops. **(10 Marks)**

b. A 4 pole DC shunt generator with lap connected armature has field and armature resistance of 50Ω and 0.1Ω respectively. If the generator supplied 60,100v, 40 watt lamps, calculate the total armature current, current in each parallel path and generated emf. Take 1v per brush as BCD. **(10 Marks)**

Module-5

9 a. With neat diagram explain the types of rotor construction of a synchronous generator. List one application of each. **(06 Marks)**

b. Explain the concept of rotational magnetic field in an Induction motor. **(08 Marks)**

c. A 12 pole 3ϕ, alternator is coupled to an engine running at 500 rpm. If supplies an Induction motor which has a full load speed of 1440 rpm. Find
i) %ship
ii) No. of poles **(06 Marks)**

OR

10 a. Derive the emf equation of an alternator. **(06 Marks)**

b. A 24 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. Its speed is 250 rpm. The winding is full pitched and k_d = 0.966 flux per pole and 67.3 mwb. Determine
i) The frequency and magnitude of line voltage
ii) Output KVA of the machine of current in each plate is 50A. **(08 Marks)**

c. With neat diagram explain the working of a star Delta starter. **(06 Marks)**