



# CBCS SCHEME

BEEE103/203

## First/Second Semester B.E./B.Tech. Degree Examination, June/July 2023 Elements of Electrical Engineering

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. VTU Formula Hand Book is permitted.  
3. M : Marks , L: Bloom's level , C: Course outcomes.

| Module - 1        |    |   | M | L  | C   |
|-------------------|----|---|---|----|-----|
| Q.1               | a. | State and explain Kirchoff's laws.  | 6 | L2 | CO1 |
|                   | b. | Find the total resistance of the circuit across the terminals X and Y. Also find the power consumed by the circuit if a 12 V battery is connected across XY.  | 6 | L2 | CO1 |
| <p>Fig. Q1(b)</p> |    |   |   |    |     |
|                   | c. | Brief about, (i) Magnetic Flux (ii) Magnetic Flux Density<br>(iii) Magneto motive force (iv) Magnetic flux density  | 8 | L1 | CO1 |
| <b>OR</b>         |    |   |   |    |     |
| Q.2               | a. | Similarities between electric and magnetic circuits.  | 8 | L2 | CO1 |
|                   | b. | Two coils having 150 and 200 turns are wound on a closed magnetic core of cross section $1.5 \times 10^{-2} \text{m}^2$ and mean length 3 m. The relative permeability is 2000. Calculate (i) The mutual inductance between the coils (ii) Voltage induced in the second coil if the current changes from 0 to 10 A in the First coil in 20 ms. | 6 | L3 | CO1 |
|                   | c. | Derive an expression for mutually induced emf.  | 6 | L3 | CO1 |
| <b>Module - 2</b> |    |   |   |    |     |
| Q.3               | a. | Derive the relation between V and I when AC is applied to RLC series circuit. Draw Phasor diagrams.   | 8 | L3 | CO2 |
|                   | b. | An AC quantity is given by the expression $i(t) = 40 \sin(314t) \text{A}$ . Determine maximum value of current, peak to peak value, angular velocity, frequency, time period and also determine the value of instantaneous current at the time 3 milli seconds.   | 6 | L3 | CO2 |
|                   | c. | Classify the types of power in AC circuit.  | 6 | L2 | CO2 |

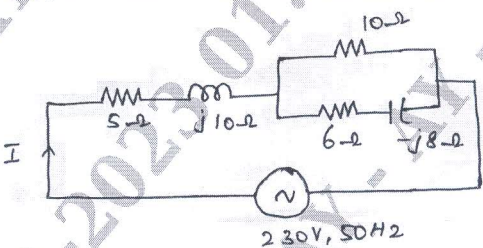
## OR

|     |    |  |   |    |     |
|-----|----|--|---|----|-----|
| Q.4 | a. | A resistance of $15 \Omega$ is connected in series with an inductance of $0.25 \text{ H}$ across $220 \text{ V}$ , $50 \text{ Hz}$ ac supply. Find (i) Total impedance (ii) Current through the circuit (iii) Voltage across the resistance (iv) Voltage across the inductance (v) Power factor (vi) Phase angle between voltage and current (vii) Active reactive and apparent power (viii) Equation for instantaneous voltage and current. | 8 | L3 | CO2 |
|     | b. | Derive the relation between $V$ and $I$ when AC is applied to RL series circuit.   | 6 | L3 | CO2 |
|     | c. | Define average and rms values of sinusoidal voltage. Also derive the respective expressions.   | 6 | L2 | CO2 |

## Module – 3

|     |    |  |   |    |     |
|-----|----|--|---|----|-----|
| Q.5 | a. | How do you generate 3-phase supply? Give the 3-phase expression and the advantages of 3-phase.   | 8 | L2 | CO2 |
|     | b. | 3 coils each having resistance of $10 \Omega$ and inductance of $0.02 \text{ H}$ are connected in star across $440 \text{ V}$ , $50 \text{ Hz}$ supply. Calculate the line current and total power consumed. | 6 | L2 | CO2 |
|     | c. | Define the following terms with respect to 3-phase supply:<br>(i) Line current (ii) Line voltage (iii) Phase current<br>(iv) Phase voltage (v) Total 3-phase power with a help of circuit diagram.           | 6 | L2 | CO2 |

## OR

|     |    |  |   |    |     |
|-----|----|--|---|----|-----|
| Q.6 | a. | 3 similar coils each having resistance of $10 \Omega$ and $8 \Omega$ inductive reactance are connected in star across $400 \text{ V}$ , balanced $3 \phi$ supply. Determine :<br>(i) Line current<br>(ii) Total power<br>(iii) Reading of each of two watt meter connected to measure power. | 6 | L3 | CO2 |
|     | b. | Obtain the relationship between the line and phase values of voltage and current in delta connection.  | 8 | L3 | CO2 |
|     | c. | Find the total power, power factor of the circuit shown.<br><br>Fig. Q6 (c)  | 6 | L3 | CO2 |

## Module – 4

|     |    |   |   |    |     |
|-----|----|---|---|----|-----|
| Q.7 | a. | Explain the construction and working of Kelvin's double bridge. | 7 | L2 | CO4 |
|     | b. | With a neat sketch, explain current transformer.                | 6 | L2 | CO4 |
|     | c. | Write short notes on Domestic wiring.                           | 7 | L2 | CO5 |

## OR

|     |    |  |   |    |     |
|-----|----|--|---|----|-----|
| Q.8 | a. | Explain the construction and working of Megger.  | 6 | L2 | CO4 |
|     | b. | Explain the construction of Maxwell's Bridge and derive the expression for unknown inductance. | 8 | L2 | CO4 |
|     | c. | Explain two way and three way control of lamp with truth table.                                | 6 | L2 | CO5 |

## Module – 5

|      |    |  |   |    |     |
|------|----|--|---|----|-----|
| Q.9  | a. | Define earthing, with neat diagram explain plate earthing.   | 6 | L2 | CO5 |
|      | b. | List out the power rating of household appliances including air conditioners, PC's, Laptops and Printers. Find total power consumed. | 8 | L2 | CO5 |
|      | c. | With a neat circuit diagram, explain the operation of Earth Leakage Circuit Breaker (ELCB).  | 6 | L2 | CO5 |
| OR   |    |  |   |    |     |
| Q.10 | a. | With diagram, explain the working of fuse and characteristics of fuse material.  | 6 | L2 | CO5 |
|      | b. | Define "unit" used for consumption of electrical energy and explain the two part tariff with its advantages and disadvantages.       | 8 | L2 | CO5 |
|      | c. | Write short notes on Miniature circuit Breaker and list its merits and demerits.   | 6 | L2 | CO5 |

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