Total No. of Questions: 22

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering / Science

End Semester Examination May 2025

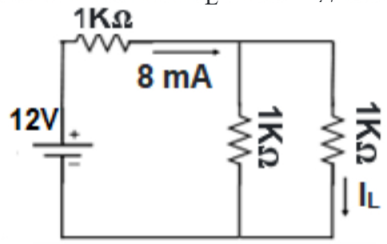
EN3ES17 / BC3ES01 Basic Electrical Engineering

Programme	:	B.Tech. / B.Sc.	**Branch/Specialisation**	:	All
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

Q1. Find the current I_L of the figure shown below using current division rule- **Marks 1 CO 4 BL 3**



- ○ 12 mA
- ○ 16 mA
- ○ 8 mA
- ◉ 4 mA

Q2. Which of the following is true for an open circuit condition? **Marks 1 CO 1 BL 1**

- ○ Current (I) is zero.
- ○ Resistance (R) is infinity.
- ○ Current (I) is infinity.
- ◉ Both (A) and (B)

Q3. Power factor is the- **Marks 1 CO 1 BL 1**

- ○ Ratio between resistance (R) and impedance (Z) of the circuit
- ○ Cosine of the angle between voltage and current of the circuit
- ○ Ratio between active power and apparent power of the circuit
- ◉ All of the above

Q4. For an R-L-C series resonance circuit, if the value of Inductance is 10mH and the value of capacitance is 100µF then the resonant frequency (f_0) would be- **Marks 1 CO 4 BL 3**

- ○ 59.1Hz
- ◉ 159.15 Hz
- ○ 259.1 Hz
- ○ 50 Hz

Q5. If the m.m.f of a simple magnetic circuit is 625 AT and its reluctance is 31000 AT/Wb then the flux through the circuit would be approximately- **Marks 1 CO 4 BL 3**

- ○ 30mWb
- ◉ 20mWb
- ○ 40mWb
- ○ 10mWb

Q6. Reluctance in a magnetic circuit corresponds to _____ in an electric circuit. **Marks 1 CO 1 BL 1**

- ◉ Resistance
- ○ Current
- ○ Voltage
- ○ Conductance

Q7. If the supply frequency and number of poles of 3-phase induction motor are 50Hz and 4 poles respectively, then the synchronous speed (Ns) would be- **Marks 1 CO 4 BL 3**

- ○ 3000 r.p.m
- ◉ 1500 r.p.m
- ○ 1000 r.p.m
- ○ 2000 r.p.m

Q8. The function of yoke in a DC machine is- **1 1 1**

- ○ It generates the required flux
- ◉ It protects the machine from external injury and provides flux path
- ○ It converts AC into DC
- ○ It supply current to the external circuit

Q9. Which of the following is/are the main parts of a modern thermal power plant? **1 1 1**

- ○ Coal and Ash handling unit
- ○ Air and flue gases circulating unit
- ○ Feed water and steam unit
- ◉ All of the given

Q10. Which material is commonly used in a fuse element due to its low melting point and high resistance? **1 1 1**

- ○ Copper
- ◉ Tin
- ○ Aluminum
- ○ Steel

Section 2 (Answer all question(s))

Marks CO BL

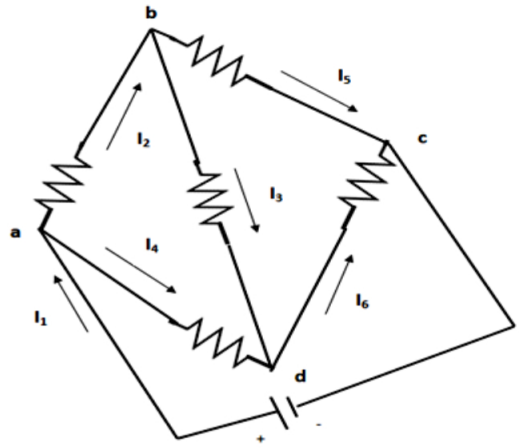
Q11. Draw the symbols of different types of dependent voltage and current sources. **2 1 2**

Rubric	Marks
Each symbol 0.5 marks (4x0.5 =2)	2

Q12. With an example, write down the various steps required for solving a network using nodal analysis method. **3 2 2**

Rubric	Marks
3steps with example each 1 mark (3X1 =3)	3

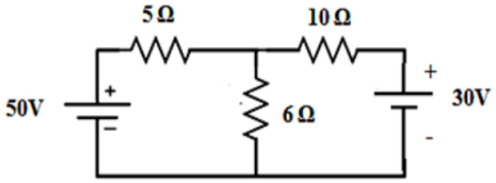
Q13. (a) Find the magnitude and direction of unknown currents using KCL (Kirchhoff's current law). Given $I_1 = 10A$, $I_2 = 6A$, $I_5 = 4A$ **5 4 3**



Rubric	Marks
Determination of 3 unknown currents 3marks correct directions of 3 unknown currents 2 marks	5

(OR)

(b) Find the current through 6Ω resistor of the network shown below using mesh analysis method.



Rubric	Marks
Two KVL equations with their simplification - 4 marks Current through 6 ohm resistor - 1 mark	5

Section 3 (Answer all question(s))

Marks CO BL

Q14. Write down the formula of r.m.s voltage (Vr.m.s) and average voltage (Vav) of AC in terms of maximum voltage (Vm). **2 1 1**

Rubric	Marks
Formula of Vr.m.s - 1 mark Formula of Vav - 1 mark	2

Q15. (a) For an A.C single phase R- L circuit: **8 4 3**

- Define the various powers with their expressions (formula) and units.
- Find the impedance and power factor of series RL circuit, if resistance (R) is 5Ω, Inductive reactance (X_L) is 15Ω.

Rubric	Marks
Define each power - 3 marks Expression of powers and their units - 3 marks Calculation of impedance and power factor (each 1 mark) - 2 marks	8

(OR)

(b) For a 3-phase delta connected supply system:

- Draw the circuit diagram and phasor diagram.
- Considering three similar load coils A, B, C, each coil having 9Ω resistance and 12Ω inductance. They are connected in delta to a 3-phase, 440V, 50Hz supply. Calculate for this load: (i) Line current (ii) the power factor

Rubric	Marks
Circuit diagram - 1 mark Phasor diagram - 2 marks Calculation of line current - 3 marks Calculation of power factor - 2 marks	8

Section 4 (Answer all question(s))

Marks CO BL

Q16. Define the following terms: **3 1 1**

- Self inductance
- Mutual inductance
- Co-efficient of coupling

Rubric	Marks
Definition of each terms 1 mark	3

Q17. (a) For a ferromagnetic material: **7 3 2**

- Draw and explain the B-H curve.
- Define the terms: m.m.f, flux and reluctance.

Rubric	Marks
B-H curve diagram - 2 mrks Explanation of B-H curve - 2 marks Definition of m.m.f, reluctance, flux (each 1 mark) - 3 marks	7

(OR)

(b) Draw the hysteresis loop of magnetic circuit. Also write and explain five analogous terms between electric and magnetic circuit.

Rubric	Marks
Hysteresis loop diagram - 2 marks Five analogous terms (1 mark each) - 5 marks	7

Section 5 (Answer all question(s))

Marks CO BL

Q18. Discuss the constructional details of single phase transformer. **4 3 2**

Rubric	Marks
Diagram - 2 marks Description - 2 marks	4

Q19. (a) With neat sketch (diagram), describe the principle of operation of DC motor in detail. **6 3 2**

Rubric	Marks
Diagram - 2 marks Principle - 2 marks Explanation - 2 marks	6

(OR)

(b) With neat sketch, describe the principle of operation of 3-phase induction motor.

Rubric	Marks
Diagram - 2 marks Principle - 2 marks Explanation - 2 marks	6

Section 6 (Answer any 2 question(s))

Marks CO BL

Q20. Differentiate between fuse and MCB. **5 5 4**

Rubric	Marks
Any five difference (1 mark each)(1X5)	5

Q21. Draw the block diagram of a hydroelectric power plant and write down the function of each component. **5 3 2**

Rubric	Marks
Diagram - 2 marks Function of each components - 3 marks	5

Q22. Write short note on: **5 3 2**

- Types of wires and cables
- Thermal power plant diagram and principle of working

Rubric	Marks
Types of wires and cables - 2 marks Thermal power plant Diagram and principle of working - 3 marks	5

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