

Total number of printed pages – 6

**63 (FY)SEM-3/SEC/PHYSEC2013**

**2025**

**PHYSICS**

Paper : PHYSEC2013

***(Electrical Network and Loads)***

*Full Marks : 40*

*Pass Marks : 16*

Time : Two hours

***The figures in the margin indicate full marks for the questions.***

1. Choose the correct answer :  $1 \times 5 = 5$

(a) The time period of an AC voltage with frequency 50 Hz is

(i) 20 milisecond

(ii) 2 milisecond

(iii) 200 milisecond

(iv) 2 second

(b) According to Kirchhoff's voltage law, the algebraic sum of voltage drop across resistors and EMFs in any closed loop network is always

- (i) Positive
- (ii) Negative
- (iii) Zero
- (iv) Unity

(c) In a dc circuit with 6 Volts supply the power dissipated in the resistor is 9 Watt. The value of the resistor is

- (i) 1.5 Ohm
- (ii) 3.0 Ohm
- (iii) 4.0 Ohm
- (iv) 6.0 Ohm

(d) To increase the current in a dc circuit with fixed resistance the voltage of the power supply must be

- (i) Decreased
- (ii) Increased
- (iii) Remains same
- (iv) Zero

(e) Power factor in a circuit can be maximized to value of

- (i) Infinity
- (ii) Zero
- (iii) Unity
- (iv) Any desired value

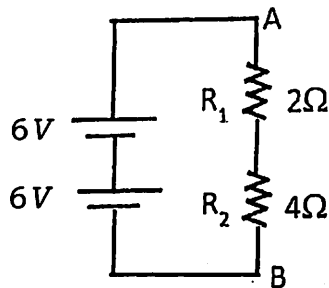
2. Answer the following questions : **(any five)**  
2×5=10

(a) In AC circuit with a sinusoidal voltage  $[V(t) = V_p \sin \omega t]$ , write down the expression for reactive impedance across an inductor (inductance= $L$ ) and reactive capacitance across a capacitor (capacitance= $C$ ).

(b) How do you connect two 100 Ohm resistors to get an equivalent resistance of 50 Ohm? Draw the circuit diagram.

(c) In a circuit, the current ( $I$ ) is flowing and power in the circuit is  $W$ . If current is reduced to half of original value, calculate how the power will be changed.

- (d) In the given circuit find the voltage across the points A and B. Also find the current flowing the circuit.

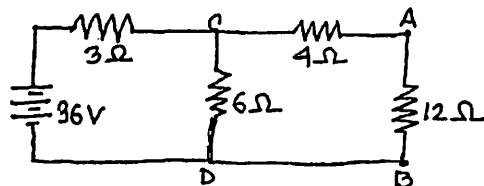


- (e) Describe a potentiometer with diagram in a circuit and its function.
- (f) Write down the expression for impedance in a AC circuit with Resistance  $R$  and Inductance  $L$ . (No capacitance)
- (g) Draw a circuit diagram to verify the Ohms law.

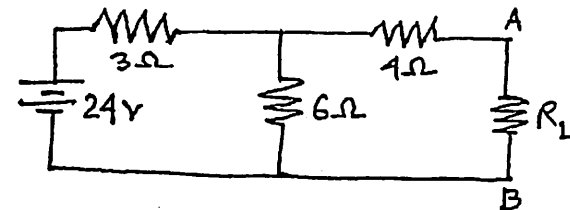
3. Answer the following : **(any three)**

$$5 \times 3 = 15$$

- (a) Using Norton's Theorem, calculate the current flowing through the 12 Ohm resistor in the following circuit.



- (b) In the given circuit find the value of load resistance  $R_L$  to be connected across the terminal A and B which would draw maximum power from the circuit. Also find the maximum power value.

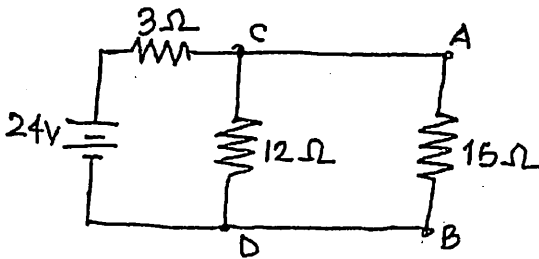


- (c) Define active, reactive and apparent power. What is significance of power factor and discuss how power factor can be maximized.
- (d) Write down the advantages and applications of three-phase AC power system.
- (e) Define transformers . Discuss the role of different types of transformers in power distribution.
- (f) Discuss the series and parallel combinations of (i) 3 resistors and (ii) 3 capacitors in a dc circuit. Find the equivalent resistance and capacitance of the combinations.

4. Answer the following : **(any one)**

$10 \times 1 = 10$

- (a) State the Thevenin's theorem. Discuss in detail how to Thevenize the given circuit below and find Thevenin voltage, Thevenin resistance. Determine the current through the load resistance  $R_L = 15 \text{ Ohm}$ .  $2+6+2=10$



- (b) Define impedance of an AC circuit. Describe the phase relationship of voltage and current in the pure resistance, in the inductor and in the capacitor of a LCR circuit for a sinusoidal voltage waveform. Use vector diagram to express the impedance of the circuit in terms of inductive reactance ( $X_L$ ), capacitive reactance ( $X_C$ ) and pure resistance  $R$ . Also define the power factor.  $2+5+2+1=10$