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 : 1×5=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

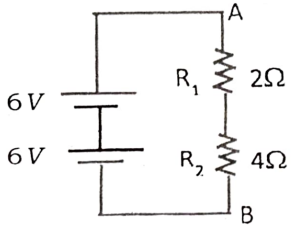
2. Answer the following questions : ***(any five)*** 2×5=10

(a) In AC circuit with a sinusoidal voltage $[V(t) = Vp\,Sin\,\omega t]$, 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.



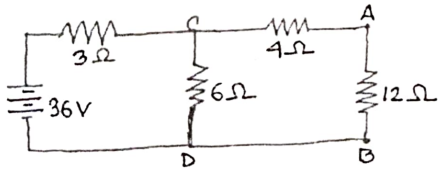
(e) Describe a potentiometer with diagram in a circuit and its function.

(f) Write down the expression for impedance in a AC circuit with Resistance *R* and Inductance *L*. (No capacitance)

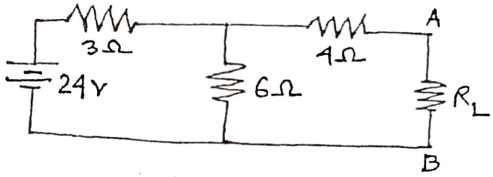
(g) Draw a circuit diagram to verify the Ohms law.

3. Answer the following : ***(any three)*** 5×3=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.

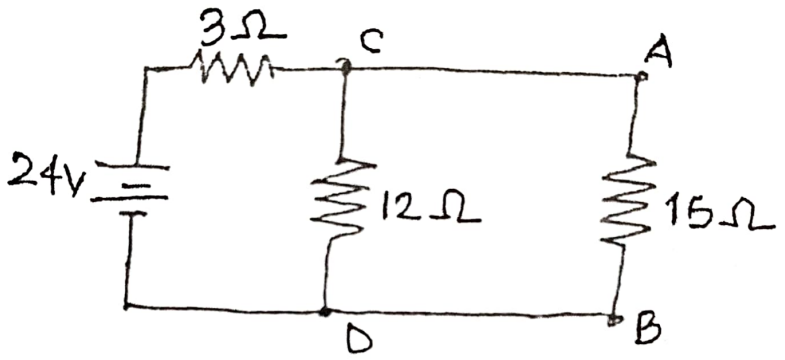
(d) Write down the advantages and applications of three-phase AC power system.

(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)*** 10×1=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 *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 (Xc) and pure resistance R. Also define the power factor. 2+5+2+1=10