

18EES101J/ BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

CYCLE TEST -1

ANSWER KEY – SET D

PART -A

1.a. ACTIVE ELEMENT:

1 Marks

Active elements are voltage and current sources which are able to supply energy to the network. (Example: Generators, Transistors, etc.)

PASSIVE ELEMENT:

These elements stores (in the form of electrostatic, electromagnetic) energy or dissipates energy. (Example-Resistor, Inductor, Capacitor)

1 Marks

1.b. LUMPED CIRCUIT:

2 Marks

A circuit component or an element, depending on the wavelength and physical length is modified as lumped or distributed elements. A circuit containing lumped elements is known as lumped circuits

$$2.R = 58.69 \text{ ohms and } I = 0.204 \text{ Ampere}$$

(2+2 = 4 Marks)

3.MAXIMUM POWER TRANSFER THEOREM:

Maximum power will be transferred from a voltage source to a load. When source resistance is equal to load resistance looking back from its load terminals.

2 Marks

PROOF: $R_{TH} = R_L$

2 Marks

PART- B

4.a. NODAL ANALYSIS

$$0.2 V_1 - 0.05 V_2 = 10$$

3 Marks

$$0.05 V_1 - 0.15 V_2 = 10$$

3 Marks

$$\Delta = 0.0275$$

1 Mark

$$\Delta_1 = 2$$

1 Mark

$$\Delta_2 = 2.5$$

1 Mark

$$V_1 = 72.73 \text{ V and } V_2 = 91 \text{ V}$$

4 Marks

4.b. **THEVENIN'S :**

V_0 = The voltage across 12 ohms resistor = $I_2 \times 12$

By mesh method, we have

$$\begin{bmatrix} 18 & -12 \\ -12 & 28 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} 96 \\ 0 \end{bmatrix}$$

$$I_2 = 96 \times 12 / (18 \times 28 - 12 \times 12)$$

$$I_2 = 3.2 \text{ Ampere}$$

2 Marks

$$V_0 = 3.2 \times 12 = 38.4 \text{ Volt}$$

2 Marks

Calculation of R_{TH} :

$$R_{TH} = 12 \times 6 / 12 + 6 = 4 \text{ Ohms (Parallel)}$$

$$= \{ (4 \times 4) \times 12 \} / 20 = 9/20 \text{ Ohms (Series \& Parallel)}$$

$$R_{TH} = 9/20 + 4 = \mathbf{8.8 \text{ Ohms}}$$

3 Marks

$$I_L = 38.4 / 8.8 + 20 = 1.333 \text{ Ampere}$$

3 Marks

$$\text{Load power} = I^2 R = (1.333)^2 \times 20 = 35.6 \text{ Watts}$$

3 Marks