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Part A (objective type)

① A network have ten 10 nodes and 17 branches. The number of different node pair voltage would be **45**

② Assuming idal element in the circuit shown below. The voltage across A, B : V_{AB} is **-3**

③ Which of the following theorm is applicable for both linear and non linear circuits **None of these**

④ Maxwell's loop current method of solving electrical networks **utilize Kirchhoff's voltag law**

⑤ For the network shown below, when $I = 0$, $V_{PQ} = 20V$ and when $r = 0$, $I = 10A$. If now $R = 3$ ohm's, ~~whatn~~ what is the value of current I **6.67 A**

⑥ The rms value of wave in figure is **about 50V**.

⑦ A capacitor store 0.15C at 5V. It capacitance will be **0.03F**.

⑧ System function $H(S) = \frac{1}{S+3}$, For a signal $\sin 2t$. the steady state responce is **1/8**.

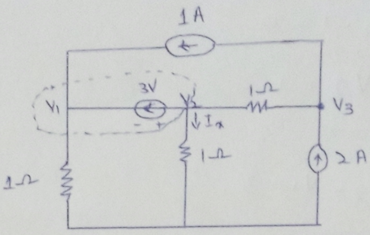
⑨ An ideal transformer has a turn ratio of 2:1. Taking hv side as a port and Iv as port 2 transmission parameters of transformer are

$$\begin{bmatrix} 2 & 0 \\ 0 & 0.5 \end{bmatrix}.$$

⑩ Wave $A = 100 \sin \omega t$ and wave $B = 100 \cos \omega t$, then **rms values of A is more than that of B.**

Q :

Ans : Sol:



The presence of a voltage source between the node 1 and node 2 make the combination of node 1 and node 2 a supernode. Hence

$$\frac{V_1}{1} - 2 + \frac{V_2}{1} + \frac{V_2 - V_3}{1} = 0 \quad \text{—— (A)}$$

For node 3,

$$\frac{V_3 - V_2}{1} - 2 + 1 = 0 \quad \text{—— (B)}$$

and axuiliry equation

$$V_2 - V_1 = 3 \quad \text{—— (C)}$$

Now combine the above three equation

So

$V_1 - 2 + V_2 + V_2 - V_3 = 0$ → From eq (A)

$V_1 + 2V_2 - V_3 = 2$

$V_3 - V_2 - 1 = 0$ → From eq (B)

$V_3 - V_2 = 1$

$V_2 - V_1 = 3$ → From eq (C)

Now combining equation (A), (B) and (C)

$\cancel{V_1} + 2V_2 - \cancel{V_3} + \cancel{V_3} - \cancel{V_2} + \cancel{V_2} - \cancel{V_1} = 2+1+3$

So

$2V_2 = 6$

$V_2 = 6/2 \Rightarrow \boxed{V_2 = 3}$

Now

$V_2 - V_1 = 3$ From eq (C)

$2 - V_1 = 3$

$-V_1 = 3-2 \Rightarrow -V_1 = 1 \Rightarrow \boxed{V_1 = -1}$

Now

$V_3 - 2 = 1$

$V_3 = 1+2 \Rightarrow \boxed{V_3 = 3}$

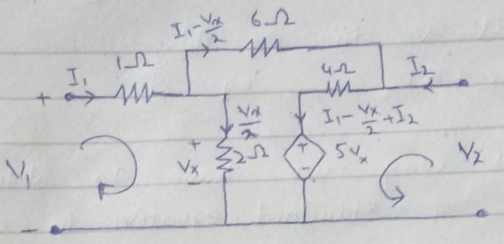
Finally

$I_x = \frac{V_2}{1} = \frac{2}{1} = 2A$

So

$\boxed{I_x = 2A}$

ns:



$+V_1 - I_1 \times 1 - V_x = 0$

⇒ $V_1 = I_1 + V_x$ —— ⓐ

⇒ $+V_2 - (I_1 - \frac{V_2}{2} + I_2) \times 4 - 5V_x = 0$

⇒ $V_2 = 4I_1 + 4I_2 + 3V_x$ —— ⓑ

Now when we compare equation ⓐ and ⓑ with their standard form you will find they are not in standard form and there fore we cannot proceed further and the problm is there because we ~~are~~ V_x is present both the equations so to have these standrd equation we have required to write down V_x in term of I_1 and I_2.

Now apply KVL

⇒ $V_x - (I_1 - \frac{V_x}{2}) \times 6 - (I_1 - \frac{V_x}{2} + I_2) \times 4 = 5V_x$

⇒ $V_x = 10I_1 + 4I_2$

put $V_x \rightarrow$ eq ⓐ

$V_1 = 11I_1 + 4I_2$ —— ⓒ

Now put V_x in eq (b)

$V_2 = 34I_1 + 16I_2$ —— eq (d)

By this way we have to obtained the set of standard equation in case of Z parameter.

$\therefore$ $Z_{11} = 11$ $Z_{12} = 4$

$Z_{21} = 34$ $Z_{22} = 16$

we know that

$A = Z_{11}/Z_{21}$, $B = |Z|/Z_{21}$

$C = 1/Z_{21}$ $D = Z_{22}/Z_{21}$