

EXPEREMENT-5

AIM: To verify the Tellegen's Theorem for two networks of same topology using MULTISIM software.

SOFTWARE REQUIRED: MULTISIM software.

THEORY:

Tellegen's theorem:

“In any liner/non linear, active/passive, time variant/invariant network, the summation of power of each branch (instantaneous power in case of AC network) is equal to zero”

So for a circuit having “n” no of branches

$$\sum_{K=1}^n v_K i_K = 0$$

Another extension is when the branch voltage v_K is from one network and branch current i_K is from an entirely different network, so long as the two networks have the same topology (same incidence matrix) Tellegen's theorem remains true.

So if for network N

Branch voltages: $v_1, v_2, v_3, \dots, v_n$

Branch currents: $i_1, i_2, i_3, \dots, i_n$

And for network N'

Branch voltages: $v'_1, v'_2, v'_3, \dots, v'_n$

Branch currents: $i'_1, i'_2, i'_3, \dots, i'_n$

Then $\sum_{K=1}^n v_K i'_K = \sum_{K=1}^n v'_K i_K = 0$ (Two networks may be at different instants)

Circuits: Following two networks are topological

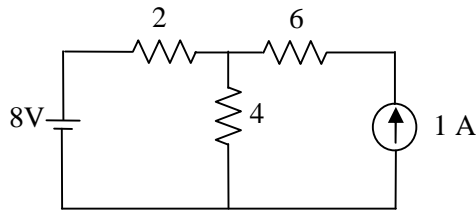


Figure 1a: Network N

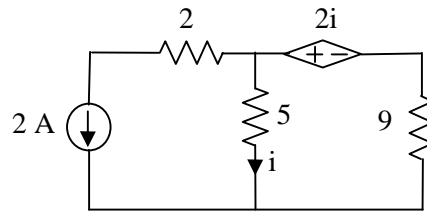


Figure 1b: Network N'

SOFTWARE CIRCUITS:

CALCULATIONS:

$$\sum_{K=1}^5 v_K i_K' =$$

$$\sum_{K=1}^5 v_K' i_K =$$

RESULT: In the above circuit and simulation Tellegen's theorem is verified for same topological network.

PRECAUTION:

1. Ground the circuit before simulation.
2. Design circuit carefully.
3. Save the file properly
4. Don't change the setting the software and computer.