

NETWORK ANALYSIS AND SYNTHESIS

Unit – II:

Network Theorems (Applications to AC Networks)

- Superposition theorem,
- Thevenin's theorem,
- Norton's theorem,
- Maximum power transfer theorem,
- Reciprocity theorem
- Millman's theorem
- Compensation theorem Tellegen's theorem.

Tellegen's Theorem

- Tellegen's Theorem is a general network theorem
- It is valid for any lump network

For a lumped network whose element assigned by associate reference direction for branch voltage v_k and branch current j_k

The product $v_k j_k$ is the power delivered at time t by the network to the element k

If all branch voltages and branch currents satisfy KVL and KCL then

$$\sum_{k=1}^b v_k j_k = 0 \quad b = \text{number of branch}$$

Tellegen's Theorem

Suppose that $\hat{v}_1, \hat{v}_2, \dots, \hat{v}_b$ and $\hat{j}_1, \hat{j}_2, \dots, \hat{j}_b$ is another sets of branch voltages and branch currents and if \hat{v}_k and \hat{j}_k satisfy KVL and KCL

Then

$$\sum_{k=1}^b \hat{v}_k \hat{j}_k = 0$$

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and

$$\sum_{k=1}^b v_k j_k = 0$$

$$\sum_{k=1}^b \hat{v}_k j_k = 0$$

Tellegen's Theorem

Applications

Tellegen's Theorem implies the law of energy conservation.

Since
$$\sum_{k=1}^b v_k j_k = 0$$

“The sum of power delivered by the independent sources to the network is equal to the sum of the power absorbed by all branches of the network”.

THANKS....

Queries Please...