Nirma University

Institute of Technology

EE302 (Network Analysis) & EE321 (Network Analysis & Synthesis)

Question Bank

Remembering

Q.1 Find condition of reciprocity and symmetry for hybrid parameter of two- port network.

Q.2 List all necessary condition of driving point function with suitable example.

Q.3 What is the significance of initial conditions? Write down initial conditions in basic circuits.

Q.4 Define following term with help of examples:

(a) Network (b) Network element (c) Branch (d) Loop or mesh

(e) Node or junction (f) Passive and active element

(g) Ideal and practical voltage sources with symbols

Q.5 What are the applications and limitations of Maximum power transfer theorem?

Q.6 List the steps for obtaining Thevenin's equivalent circuit with the help of Suitable example.

Q.7 What do you mean by graph of network also mention its significance and limitations.

Q.8 What are the conditions to be satisfied for polynomial to be Hurwitz?

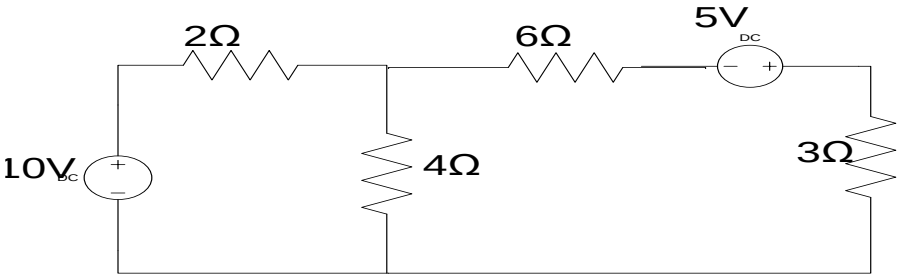
Q.9 Define network synthesis. How it is different from network analysis.

Q.10 How the location of poles affects the performance of the system.

Q.11 List the necessary and sufficient conditions for location of poles and zeros in driving point function.

Q.12 Why ABCD-parameters are known as Transmission parameters.

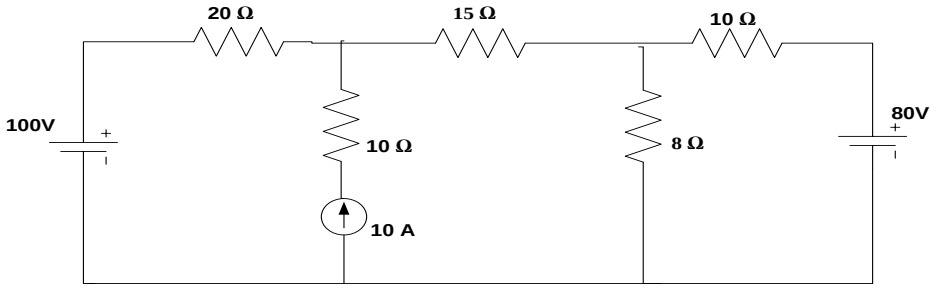
Q.13 Find power-loss in 4Ω resistor by using Superposition theorem.



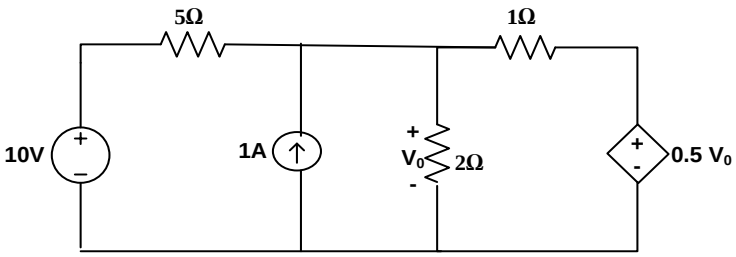
Q.14 Find the Laplace transform of the following

1. $u(t - a)$
2. $r(t - a)$
3. $\delta(t - a)$

Q.15 Select superposition theorem and find the power loss in in 8Ω resistor in the network of given figure.



Q.16 Find the voltage across 2 ohm resistor (V_0) using nodal analysis for given network in figure.



UNDERSTANDING:

Q.1 Illustrate the open circuit parameter for solving two port network.

Q.2 Illustrate the short circuit parameter for determining the admittance of two port network.

Q.3 Show that "Equivalent Z parameter of series connected network is the summation of individual Z parameter".

Q.4 Show that "Equivalent ABCD parameter of cascade connected network is the multiplication of individual Z parameter".

Q.5 Explain the reciprocity of in two port network using h-parameter.

Q.6 Explain the symmetricity in two port network using g-parameter.

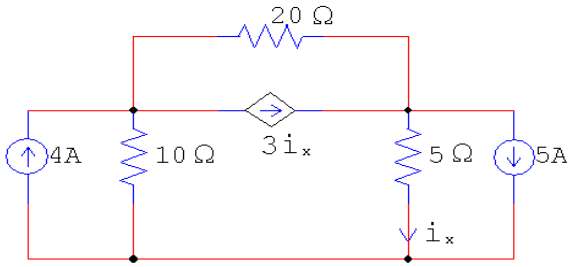
Q.7 Demonstrate that the summation of all element in column of incidence matrix is zero.

Q.8 Outline the orthogonal properties used to analyse the electrical circuit using graph theory with suitable example.

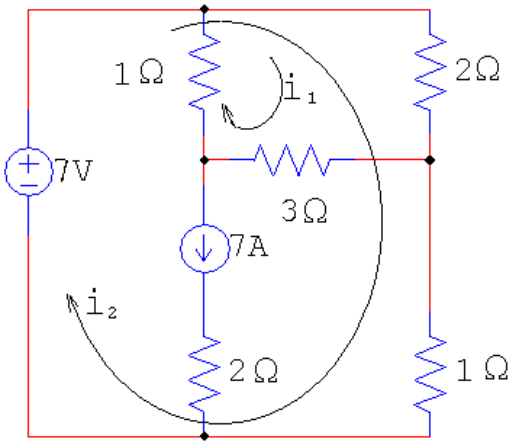
Q.9 Relate the ABCD parameters in terms of h-parameters.

Q.10 Relate the Z parameters in term of g-parameters.

Q.11 Illustrate the use of mesh analysis and nodal analysis to solve the network given in below figure.



Q.12 Demonstrate the use of Tellegen's theorem to show that total delivered power is always equal to the power absorbed in the circuit given in below figure



Q.13 Explain the time constants in the RC network and derive time dependent equation of the capacitor voltage.

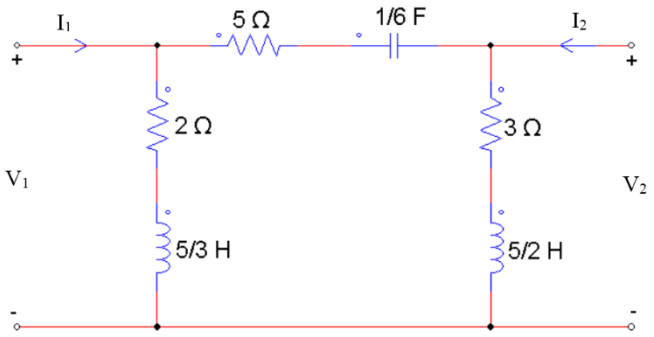
Q.14 Explain the time constants in the RL network and derive time dependent equation of the inductor current.

Q.15 Show that during switching the inductor will behave like open circuit.

Q.16 Show that during switching the capacitor will behave like short circuit.

Q.17 Show that the response in the LC network is always oscillatory in nature.

Q.18 Compare the different network functions for the circuit given in below figure.



Q.19 Compare different standard test signal used to analyze the circuit for transeint behaviour.

Q.20 Show that in the absensec of active element in the circuit the response is always oscillatory using laplace transformation.

Q.21 Illustrate the following:

(a) Superposition theorem

(b) Reciprocity theorem.

Q.22 Explain the concept of poles and zeros and their physical significance.

Q.23 Explain how sinusoidal signal is represented in time domain as well as frequency domain.

Q.24 Classify following with the help of examples:

(a) Unilateral and bilateral network

(b) Dependent and independent sources

(c) Active and passive network

Q.25 Summarize the following:

(a) Reciprocity and symmetry

(b) Transfer impedance and admittance.

Q.26 Explain the time scaling and time shifting property of Fourier transform.

Q.27 Explain the initial and final value theorem of Laplace transform.

Q.28 Demonstrate the concept of Super-mesh and Super-node using suitable examples.

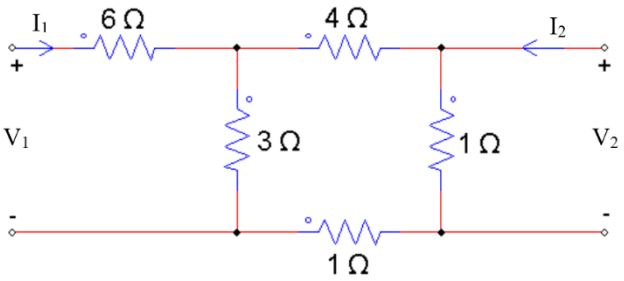
Q.29 Relate the ABCD-parameters with Z -parameters and Y -parameters.

Q.30 Illustrate the behavior of various passive elements at $t = 0$ and $t = \infty$ with equivalent circuit.

Q.31 Demonstrate the effect of a zero on the performance of the network using suitable example.

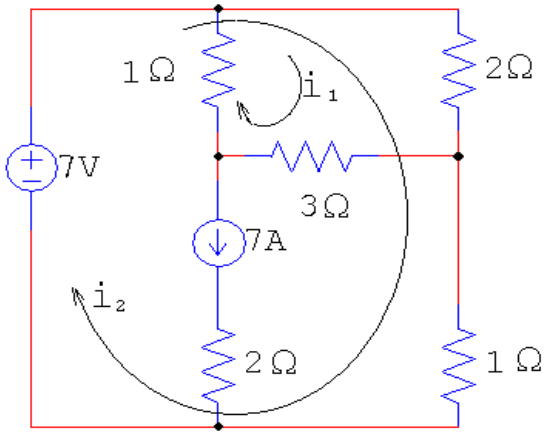
APPLYING:

Q.1 Construct the inverse hybrid parameters of the circuit shown in figure below.

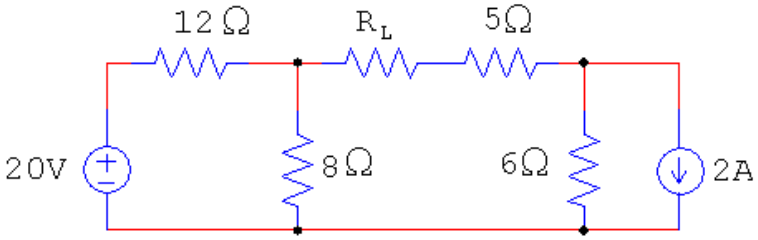


Q.2 Model the driving point and transfer impedance of a two port network. Also show the necessary condition for proper transfer function.

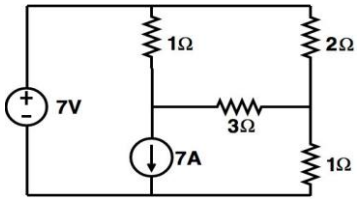
Q.3 Construct the cut set matrix of the circuit shown in the figure below.



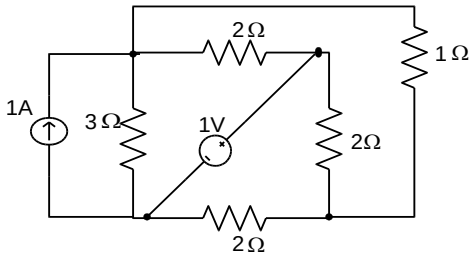
Q.4 Construct the tie set matrix of the circuit shown in the figure below



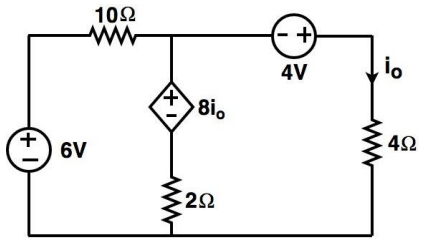
Q.5 Make use of nodal analysis to find the power dissipated in the 3Ω resistor.



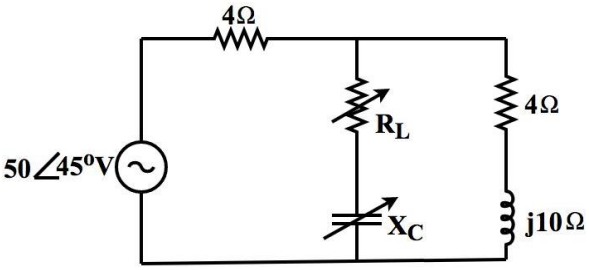
Q.6 Make use of Superposition to find the current in 3Ω resistor.



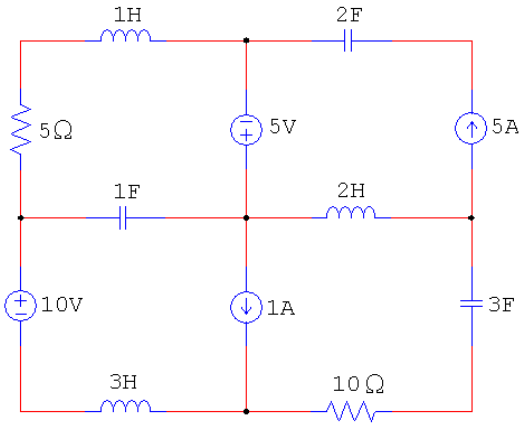
Q.7 Make use of Norton theorem to develop Norton equivalent circuit across 4Ω resistor.



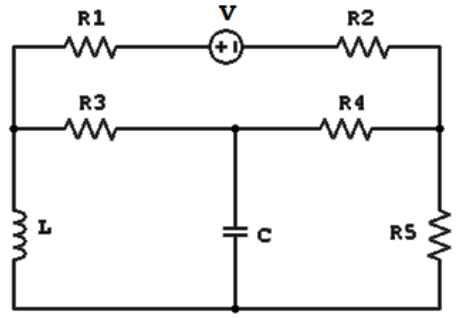
Q.8 Make use of Maximum power transfer theorem to determine load resistance for which maximum power can be delivered. Also determine the delivered maximum power.



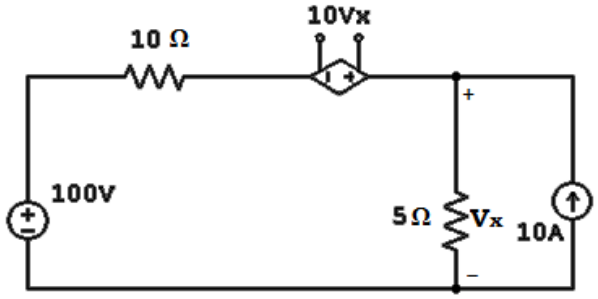
Q.9 Explain the duality for electrical circuit. Develop the exact dual of the circuit shown in the figure below.



Q.10 Build the dual of the circuit given in the figure below.



Q.11 Identify the current flowing through the 10Ω resistor using superposition theorem.



Q.12 Develop pole-zero diagram of given network function V(s) and obtain its time domain response by graphical method.

$$V(s) = \frac{5s}{(s+2)(s^2+2s+2)}$$

Q.13 Identify whether the following polynomial are Hurwitz or not

i. s^4+3s^2+2s+1

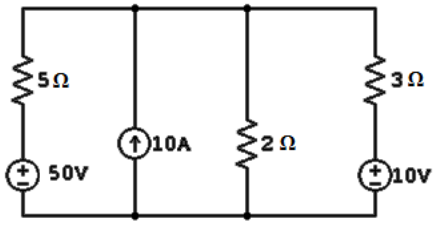
ii. s^3+6s^2+2s+8

iii. s^4+2s^2+4

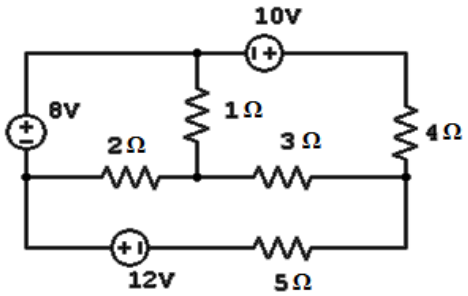
Q.14 Identify whether the given impedance function represent LC, RC or RL network. Also develop the network.

$$Z(s)=\frac{3(s+2)}{(s+1)(s+4)}$$

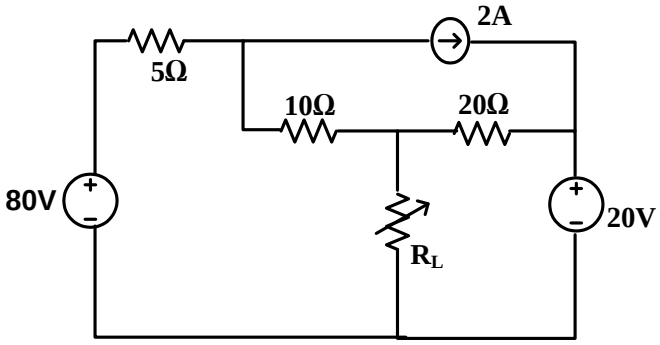
Q.15 Make use of Norton equivalent circuit to determine the current in 2Ω resistor.



Q.16 Make use of superposition theorem to determine the current through 5Ω resistor.



Q.17 Make use of maximum power transfer theorem to determine the value of load resistance R_L for which maximum power can be transferred.



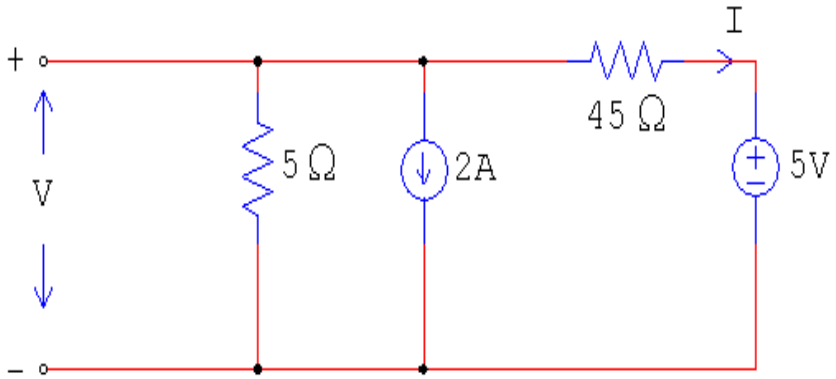
Q.18 The reduced incidence matrix of an oriented graph is given below

$$A = \begin{bmatrix} 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

(a) Construct the graph.

(b) Build the tieset and f-cutset matrices.

Q.19 Make use of Source transformation to determine the V and I for the network shown below.



Q.20 Construct the reciprocity and symmetricity condition for T network using open circuit impedance parameters.

Q.21 Select suitable technique and determine the current in 6Ω resistor in the network of given figure.

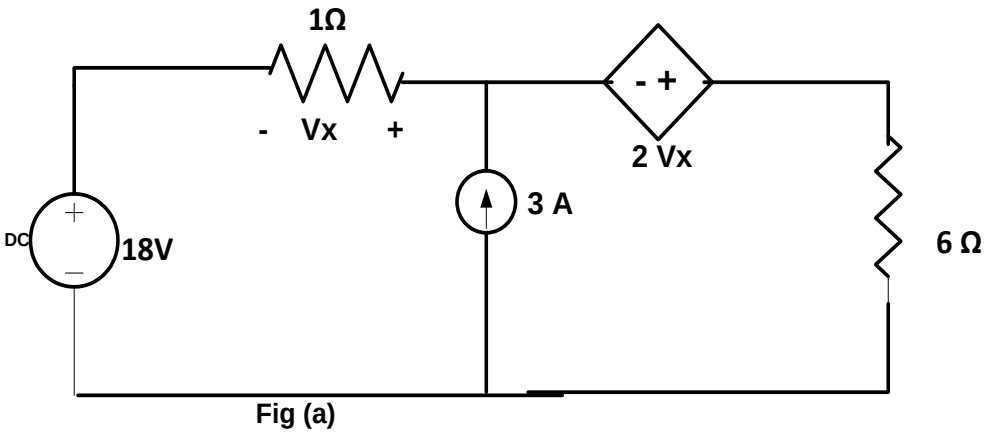
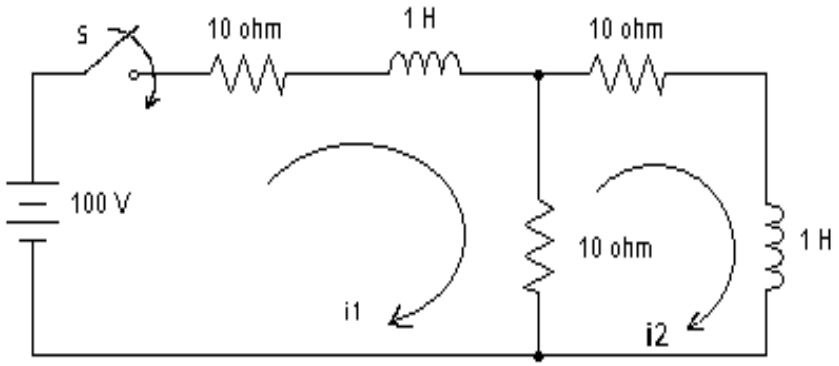
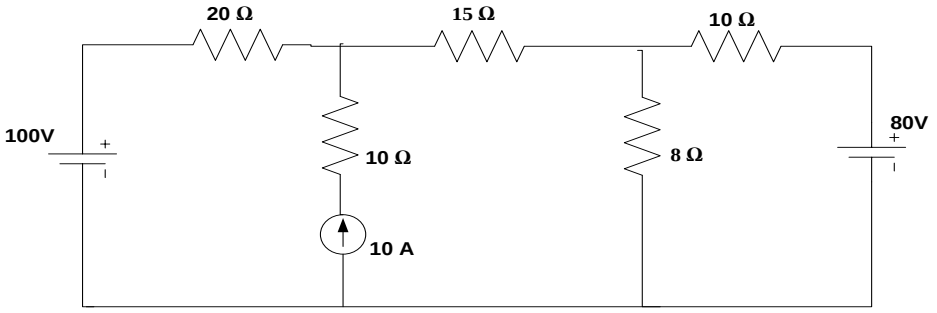


Fig (a)

Q.22 Utilize Laplace transform technique and obtain expressions for i1(t) and i2(t) in the network shown below when the switch "S" is closed at t=0.



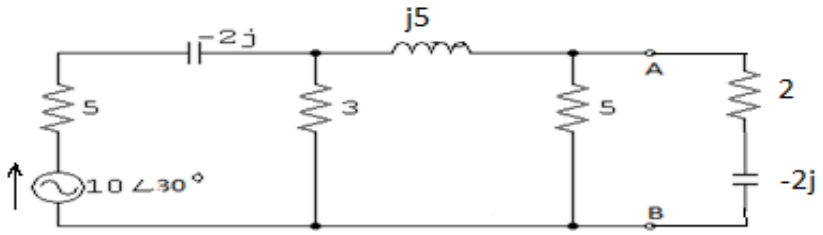
Q.23 Apply superposition theorem and obtain the power loss in in 8Ω resistor in the network of given figure.



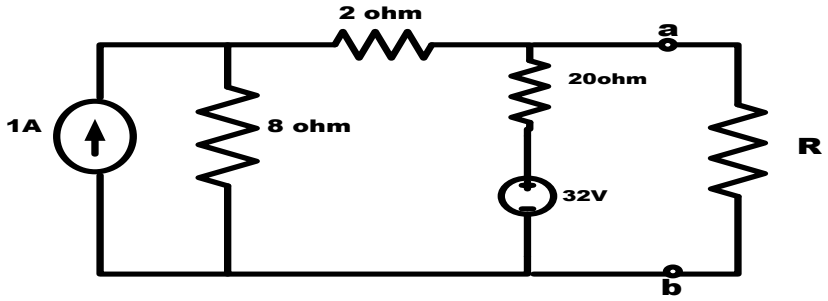
Q.24 Apply Routh-Hurwitz criterion to solve the polynomial

$$X(s) = 3s^5+4s^4+2s^3+3s^2+8$$

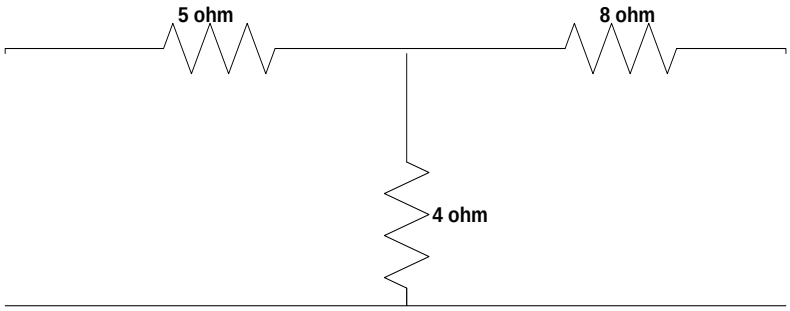
Q.25 Make use of Nodal analysis method and calculate current through impedance connected between terminals AB.



Q.26 Construct the Thevenin's equivalent circuit across points **a** and **b** in network shown in figure.

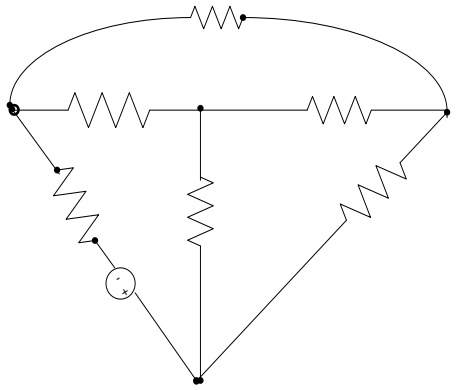


Q.27 Utilize the relationship between ABCD parameters and Z parameters and find the ABCD parameters of the network given in figure.

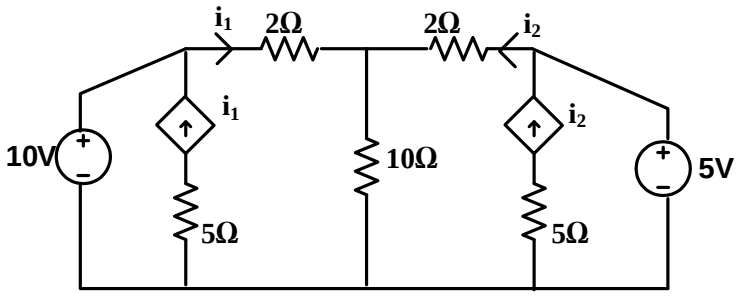


Q.28 Construct equivalent circuit of a two port network in terms of (a) impedance parameter (b) admittance parameter. Relate the transmission parameter and impedance parameter.

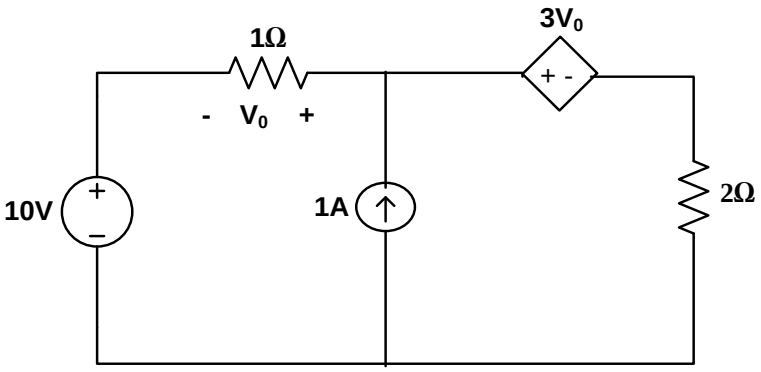
Q.29 Construct the oriented graph shown in figure and develop tieset matrix and f-cutset matrix.



Q.30 Make use of Superposition theorem and obtain the currents I_1 and I_2 in the network shown in figure.

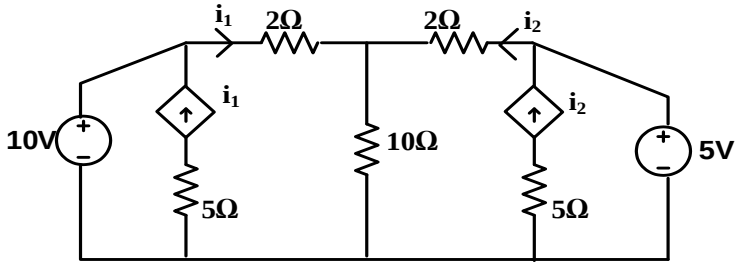


Q.31 Choose any suitable technique and obtain the current through 2 ohm resistor in network shown in figure



Analyzing

Q.1 Analyze the given figure and apply suitable technique to obtain the currents I_1 and I_2.

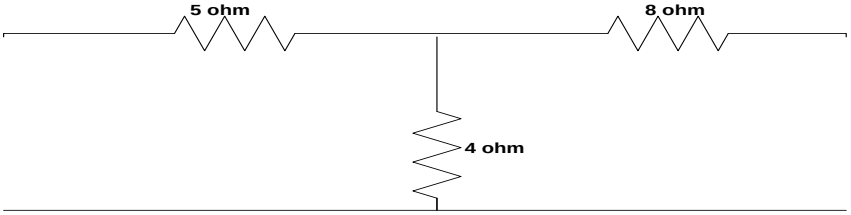


Q.2 Distinguish following with the help of examples:

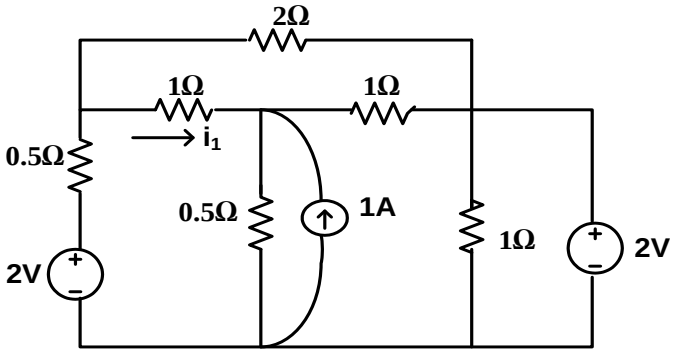
a) Unilateral and bilateral network
b) Dependent and independent sources
c) Active and passive network.

Q.3 Inspect that the overall transmission parameter matrix for cascaded two-port network is simply the matrix product of transmission parameter of individual two-port network in cascade.

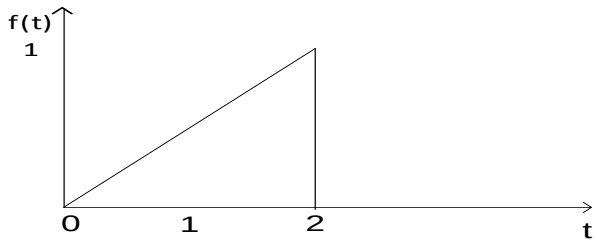
Q.4 Relate the ABCD parameters and Z parameters and evaluate the ABCD parameters of the network given in figure.



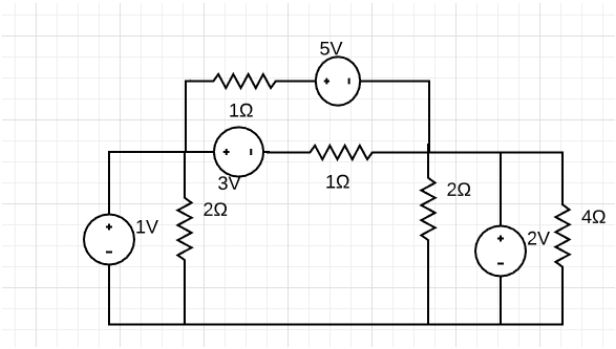
Q.5 Simplify the network shown in figure using source transformation method and determine the branch current i_1.



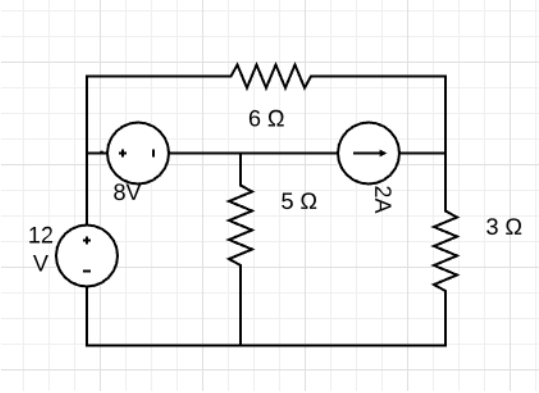
Q.6 Analyze the given waveform to write the expression for function f(t) also determine the Fourier transform F(s) for function f(t).



Q.7 Analyze the currents through each of the sources and their respective power dissipation.



Q.8 Inspect the voltage across 3 Ω resistor below.



Evaluating

Q.1 Interpret the given reduced incidence matrix of an oriented graph

$$A = \begin{bmatrix} 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

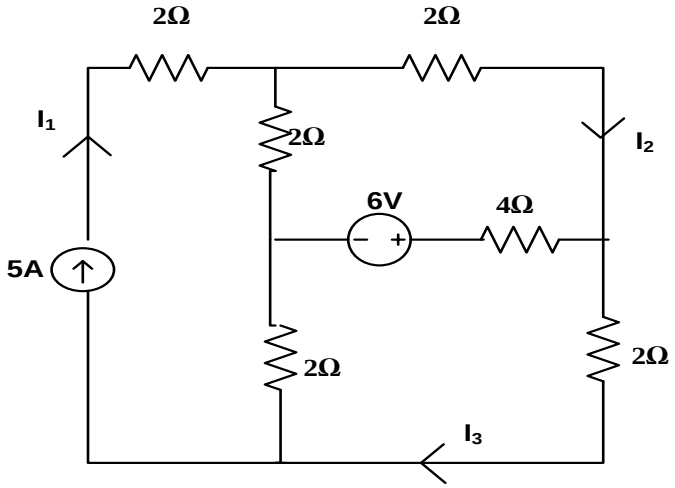
(a) Construct the graph.

(b) How many trees are possible for this graph.

(c) Build the tieset and f-cutset matrices.

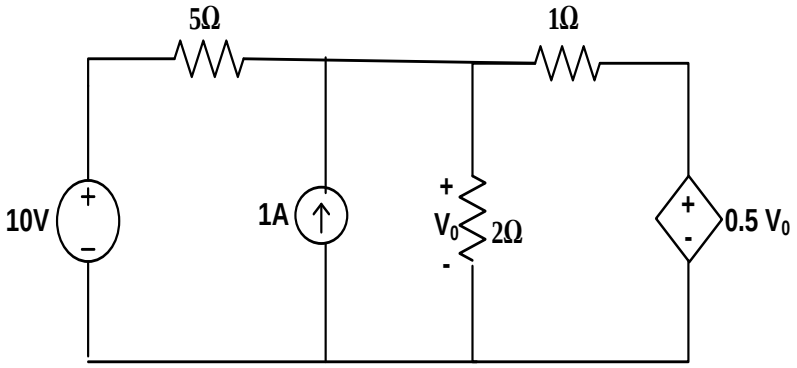
Q.2 Conclude the condition of reciprocity and symmetry for hybrid parameter of two-port network.

Q.3 Determine currents I_1, I_2, I_3 for network given in figure using Mesh Analysis.

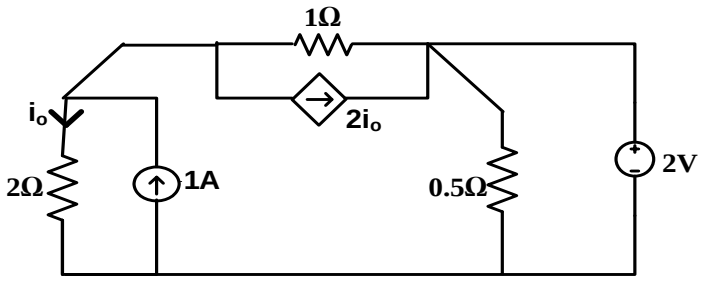


Q.4 Explain the concept of poles and zeros and their physical significance.

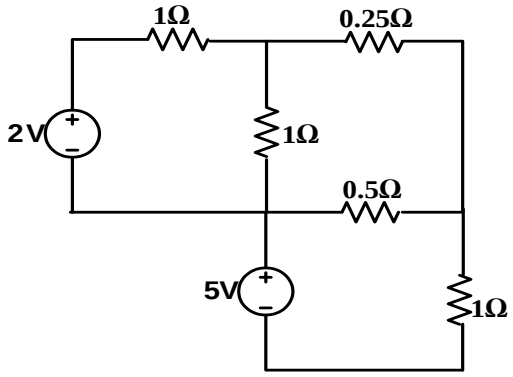
Q.5 Evaluate voltage across 2 ohm resistor (V_0) using mesh analysis for given network in figure.



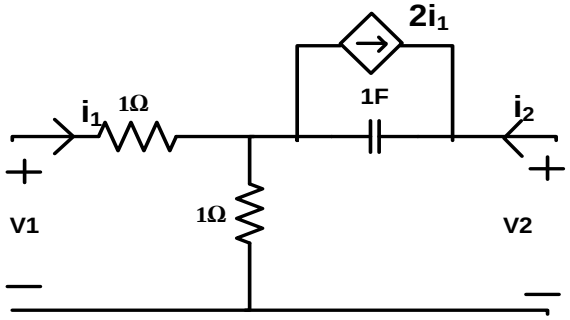
Q.7 Determine the power loss in all the resistor using suitable technique in the circuit shown in figure.



Q.8 Evaluate the current through 2V source in the circuit shown in figure,

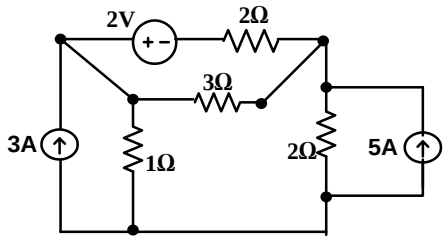


Q.9 Determine h- parameter for network shown in figure.

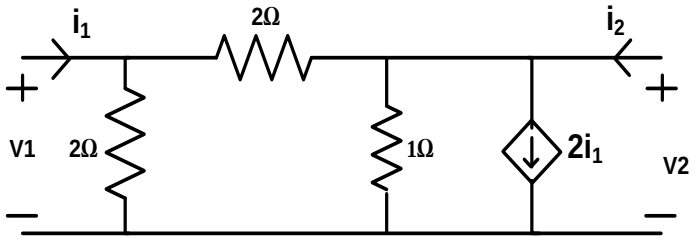


Q.10 Prove that under maximum power transfer condition, load resistance R_L and equivalent resistance across load terminals R_{eq} are equal in magnitude.

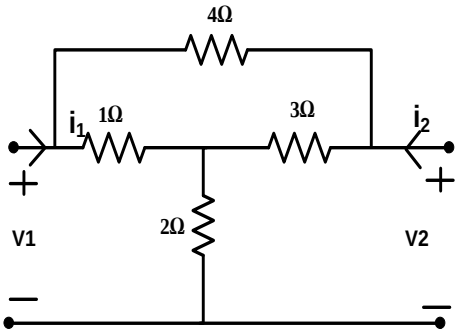
Q.11 Determine the current through 1Ω resistor in network shown in figure using Norton's theorem



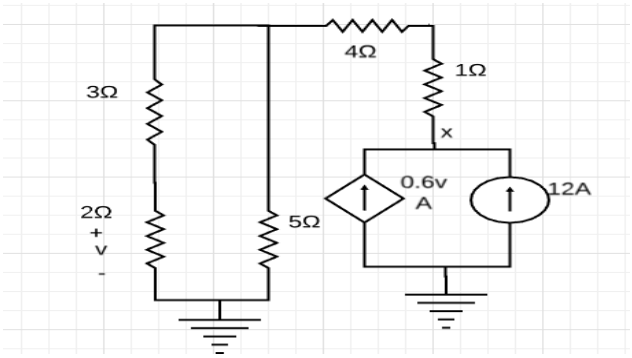
Q.12 Evaluate the Y and Z- parameter for network shown in figure.



Q.13 Determine Y and Z- parameter for network shown in figure.

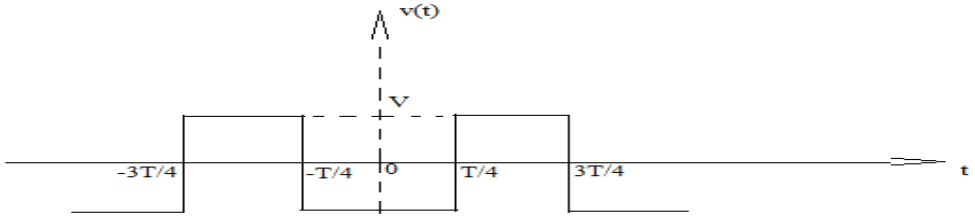


Q.14 Evaluate V in the network given below. Also find the potential difference between node x and earth.

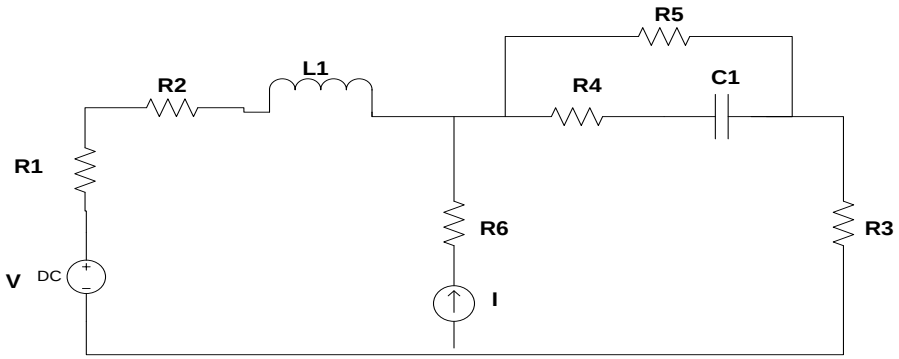


Creating

Q.1 Develop the trigonometric Fourier series for the waveform shown below. Also illustrate its line spectrum.

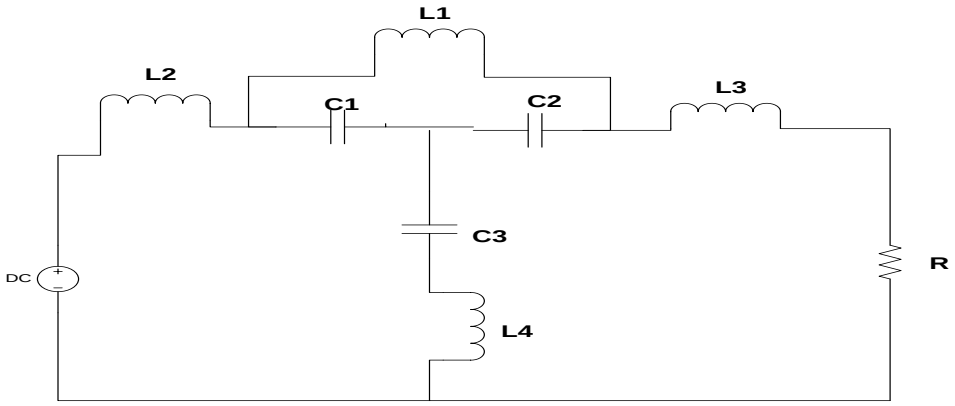


Q.2 Construct graph, oriented graph and tree of the network shown in figure and write incidence matrix of the same.

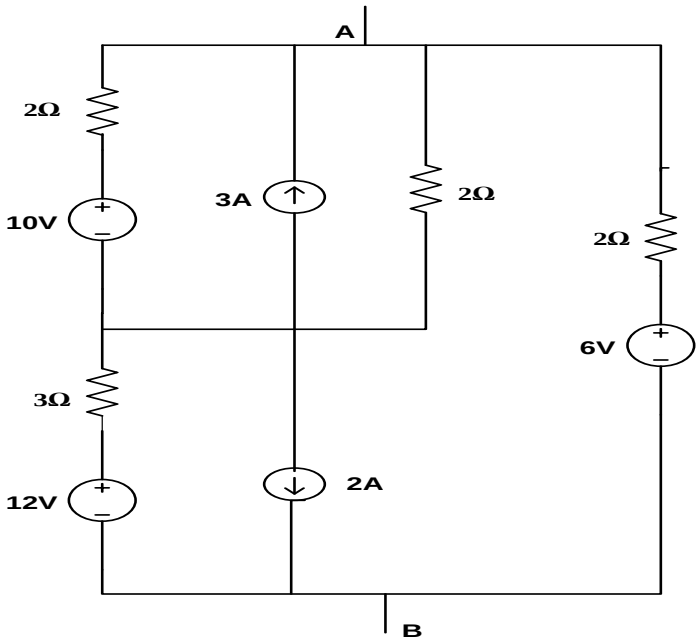


Q.3 Discuss the conditions to be satisfied for polynomial to be Hurwitz?

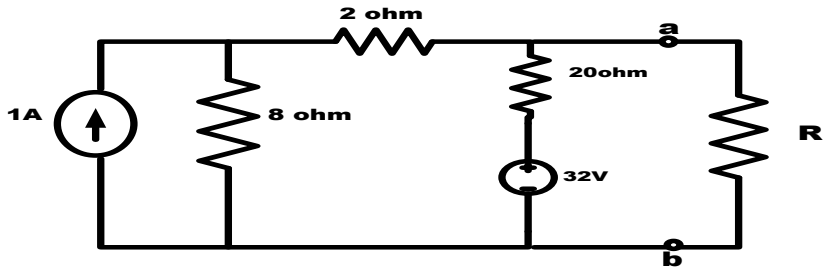
Q.4 Construct the dual network of network shown in figure.



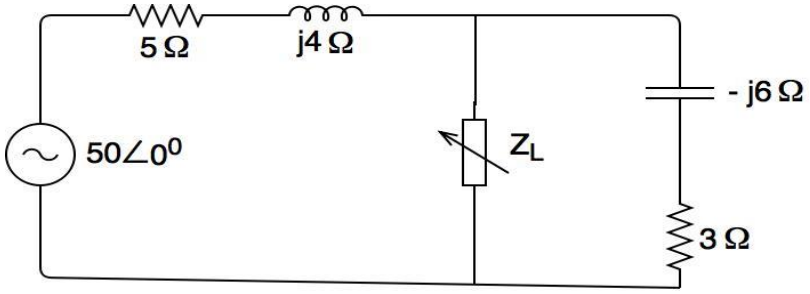
Q.5 For a network given in figure, Build an equivalent network consists of only one current source across terminals A and B using source transformation.



Q.6 Develop the Thevenin's equivalent circuit across points **a** and **b** in network shown in figure.



Q.7 Estimate the value of Z_L for maximum power transfer in the circuit of given figure if (a) Z_L is a pure resistance (b) Z_L is complex impedance with both variable resistance and reactance (c) Z_L is complex impedance with variable resistance and reactance of j3Ω.



Q.8 **Creat**e the exact dual of the given network.