

B. Tech.  
 Year: II Semester: IV  
 Test-1 (Examination): 2025 - 2026

NETWORK ANALYSIS AND SYNTHESIS

Time: 1 Hrs.

Max. Marks: 10

Note: Answer all questions.

Q. 1 Attempt any Two parts of the following. Q. 1(a) is compulsory.

- (a) State Thevenin's theorem and find the Thevenin's equivalent circuit at terminals AB for the circuit shown in Figure 1. 3

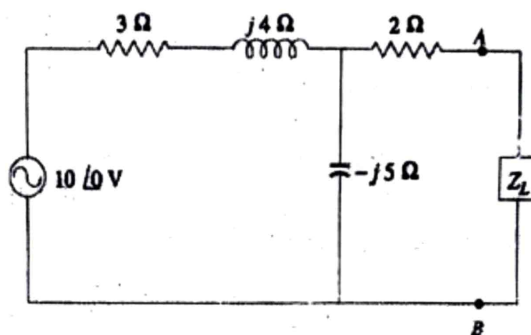


Figure 1

- (b) What is superposition theorem? Explain and write its limitations. 2  
 (c) State and verify Tellegen's theorem for the circuit shown in Figure 2.

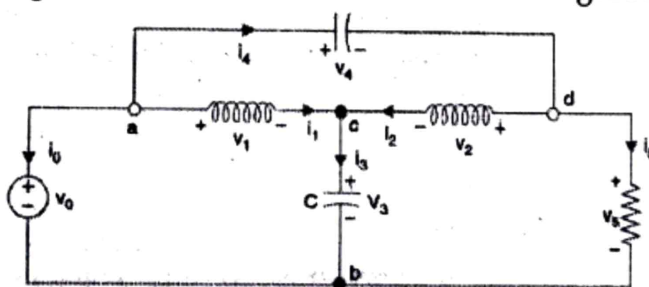


Figure 2

Q. 2 Attempt any Two parts of the following. Q. 2(a) is compulsory.

- (a) Discuss the open circuit impedance parameters of a two-port network. Also derive the conditions of reciprocity and symmetry in this case. 3  
 (b) Determine the open circuit impedance parameters of the network shown in Figure 3. 2

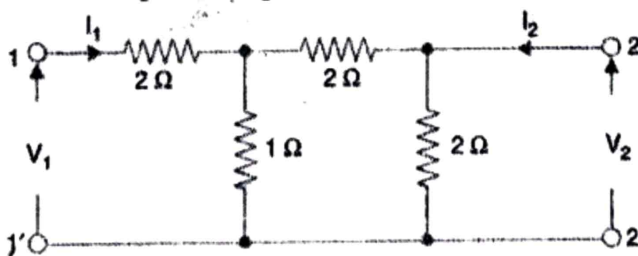


Figure 3

- (c) Determine the transmission parameters of the same network shown in Figure 3 in question 2(b). 2

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Sub Code: BEE258

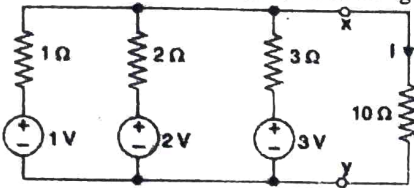
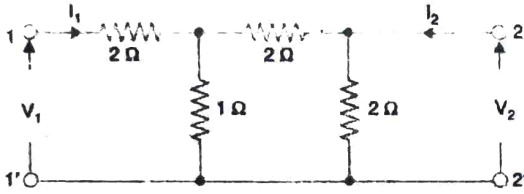
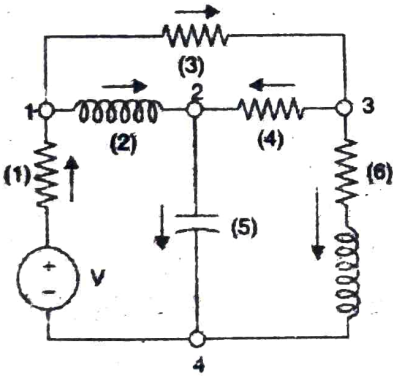
**B. Tech. Electrical Engineering (4 Credits)**  
**Year: II Semester: IV**  
**Even Semester 2025-2026**

**Subject Name: NETWORK ANALYSIS AND SYNTHESIS**

**Time: 3 Hr.**

**Max Marks: 50**

**Note: Attempt All questions.**

Q1.	Attempt any five parts of the following.	Marks	CO	BL	PO	PI Code
a)	State and explain the Norton's theorem.	2	1	1,2	1,2	1.3.1
b)	State and explain the reciprocity theorem.	2	1	1,2	1,2	1.3.1
c)	State and verify Millman's theorem for the circuit shown in Figure 1.	2	1	1,2,3	1,2	1.1.2
	 <p>Figure 1</p>					
d)	What are the transmission parameters of a two-port network? Discuss.	2	2	1,2	1,2	2.1.2
e)	Determine the transmission and inverse transmission parameters of the network shown in Figure 2.	2	2	2,3	1,2	2.1.3
	 <p>Figure 2</p>					
f)	Derive the conditions of symmetry of a two-port network in terms of its Z-parameters.	2	2	1	1,2	1.1.1
g)	Discuss the series connection of two-port networks.	2	2	1	1,2	1.3.1
<b>Q2.</b>	<b>Attempt any two parts of the following.</b>					
a)	For the network shown in following Figure 3 draw the oriented graph and its trees. What are its nodes, branches, twigs, links, trees and cotrees?	5	3	2,3	1,2	1.3.1
	 <p>Figure 3</p>					
b)	Consider a network shown in Figure 3, for it's an oriented graph write the complete and reduced incidence matrices. Also write the properties of complete incidence matrices.	5	3	1,2,3	1,2	1.3.1
c)	In graph theory of electrical networks, what is a tie-set matrix? Explain.	5	3	1,2	1,2	1.3.1
<b>Q3.</b>	<b>Attempt any two parts of the following.</b>					
a)	What is network function? Define the network functions for one-port and two-port networks.	5	4	1	1,2	1.1.2
b)	Determine the driving point impedance function of the ladder network shown in the following Figure 4.	5	4	2,3	1,2	1.1.2

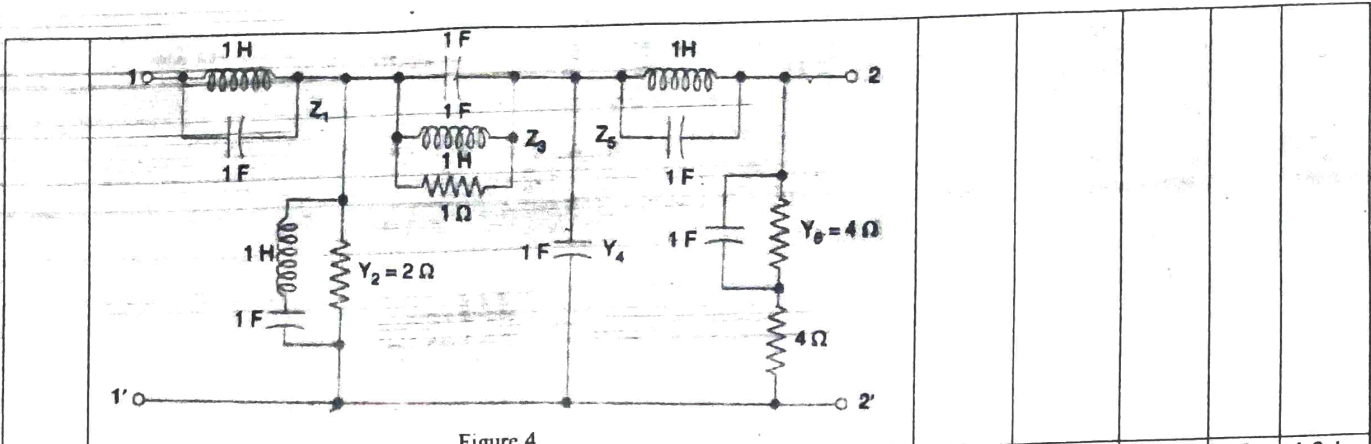


Figure 4

c)	What are the necessary conditions for driving point functions?	5	4	1	1,2	1.2.1
<b>Q4.</b>	<b>Attempt any two parts of the following.</b>					
a)	What is a positive real function? Define and write its properties.	5	4	1	1,4	1.2.1
b)	What is a Hurwitz polynomial? Test whether the following polynomial is a Hurwitz polynomial? $p(s) = s^7 + 2s^6 + 2s^5 + s^4 + 4s^3 + 8s^2 + 8s + 4$	5	4	1,3,5	1,4	4.1.1
c)	Test whether the following function is a positive real function? $F(s) = \frac{2s^4 + 7s^3 + 11s^2 + 12s + 4}{s^4 + 5s^3 + 9s^2 + 11s + 6}$	5	5	3,5	1,4	4.1.1
<b>Q5.</b>	<b>Attempt any two parts of the following.</b>					
a)	Discuss the Foster-I and II forms of network realizations of an L-C driving point immittance function.	5	5	1,2	1,3	1.1.2
b)	Determine the Foster-I and Cauer-I forms of realization of the driving point impedance function given as $Z_D(s) = \frac{4(s^2 + 1)(s^2 + 9)}{s(s^2 + 4)}$	5	5	6	1,3	3.2.1
c)	Given the driving point impedance function of a R-C network $Z_D(s) = \frac{(s + 1)(s + 3)(s + 5)}{s(s + 2)(s + 4)(s + 6)}$ Determine the Cauer-I and II forms of network realizations.	5	5	6	1,3	3.2.1

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Subject Code: BEE-252

B. Tech.  
 Year: II Semester: IV  
 Test-2 (Examination): 2022 - 2023

NETWORK ANALYSIS AND SYNTHESIS

Time: 1 Hrs.

Max. Marks: 10

Note: Answer all questions.

Q. 1 Attempt any Two parts of the following. Q. 1(a) is compulsory.

- (a) For the network shown in following Figure 1 draw the oriented graph and write its complete and reduced incidence matrices. 3

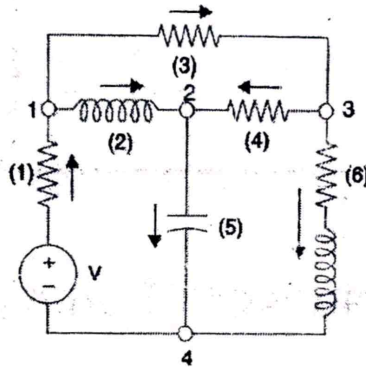


Figure 1

- (b) In graph theory of electrical networks, what is a cut-set matrix? Explain. 2
- (c) Determine the transfer function of the ladder network shown in the following Figure 2.

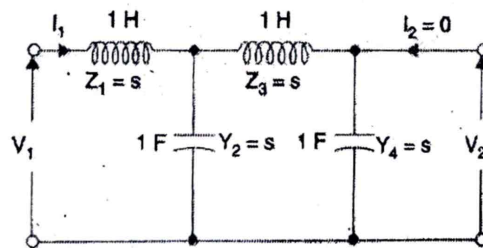


Figure 2

Q. 2 Attempt any Two parts of the following. Q. 2(a) is compulsory.

- (a) What is a Sturm's test? Discuss with suitable examples. 3
- (b) Test whether following polynomial is a Hurwitz polynomial? 2
- $$p(s) = 2s^4 + 5s^3 + 6s^2 + 3s + 1$$
- (c) Write the properties of L-C immittance functions. Draw a graph showing the variations of  $X(\omega)$  as  $\omega$  varies from 0 to  $\infty$ . 2

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B. Tech.  
(SEM IV) EVEN SEMESTER  
MAJOR EXAMINATION 2022 - 2023

NETWORK ANALYSIS AND SYNTHESIS

Time: 3 Hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carry equal marks.

1. Attempt any five parts of the following: (5 × 2 = 10)

- (a) State and explain Norton's theorem.
- (b) State and prove maximum power transfer theorem for an ac circuit.
- (c) What are the open circuit impedance parameters? Discuss.
- (d) Derive the conditions of symmetry for a two-port network in terms of its Z-parameters.
- (e) For the network shown in following Figure 1 draw the oriented graph and its trees.

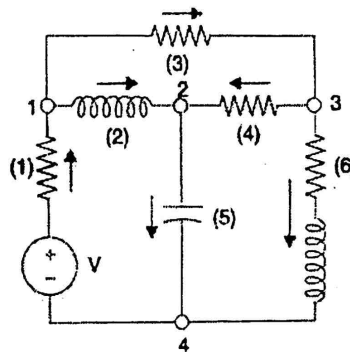


Figure 1

- (f) What are the necessary conditions for driving point functions?
- (g) Test whether following polynomial is a Hurwitz polynomial?  
 $p(s) = s^5 + 12s^4 + 45s^3 + 60s^2 + 44s + 48$

2. Attempt any two parts of the following: (2 × 5 = 10)

- (a) State and prove superposition theorem with suitable examples. Discuss its limitations.
- (b) State and explain the reciprocity theorem with a suitable example.
- (c) State and explain the Millman's theorem with a suitable example.

3. Attempt any two parts of the following: (2 × 5 = 10)

- (a) Determine the transmission and inverse transmission parameters of the network shown in Figure 2.

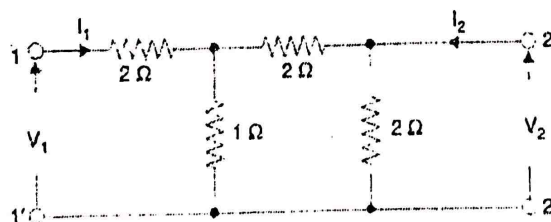


Figure 2

- (b) For a two-port network, derive open-circuit impedance and short-circuit admittance parameters in terms of its hybrid parameters.
- (c) Discuss the series-parallel connection of two-port networks.

4. **Attempt any two parts of the following:** **(2 × 5 = 10)**

- (a) Consider an electrical network shown in Figure 1 same as in question 1(e), for its an oriented graph write the complete and reduced incidence matrices. Also write the properties of complete incidence matrices.
- (b) What is network function? Define the network functions for one-port and two-port networks.
- (c) Determine the driving point impedance function of the ladder network shown in the following Figure 3.

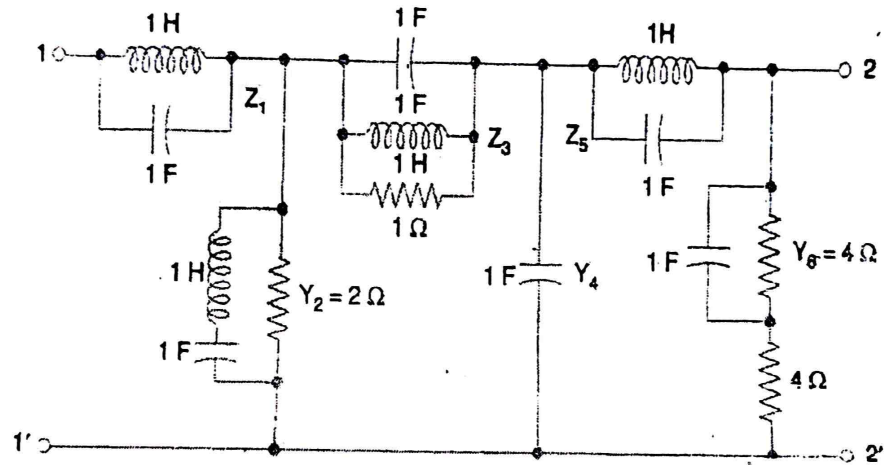


Figure 3

5. **Attempt any two parts of the following:** **(2 × 5 = 10)**

- (a) What is a positive real function? Define and write its properties.
- (b) Discuss the Foster's synthesis method for LC driving point immittances.
- (c) Given the driving point impedance function of an R-C network as

$$Z_p(s) = \frac{(s+1)(s+3)(s+5)}{s(s+2)(s+4)(s+6)}$$

Determine the Foster-I and II forms of realizations.

Subject Code: BEE-252

Roll No.

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B. Tech.  
Year: II Semester: IV  
Test-2 (Examination): 2023 - 2024

NETWORK ANALYSIS AND SYNTHESIS

Time: 1 Hrs.

Max. Marks: 10

Note: Answer all questions.

- Q. 1 Attempt any Two parts of the following. Q. 1(a) is compulsory.  
(a) For the network shown in following Figure 1 draw its oriented graph and trees. What are its nodes, branches, twigs, links, trees and cotrees? 3

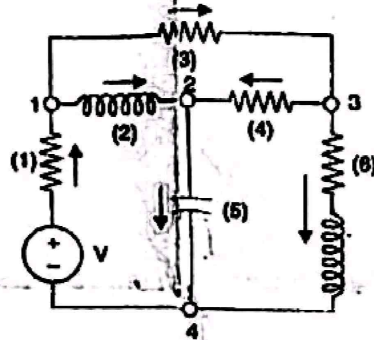


Figure 1

- (b) What are the necessary conditions for driving point functions? 2  
(c) Determine the transfer function of the ladder network shown in the following Figure 2.

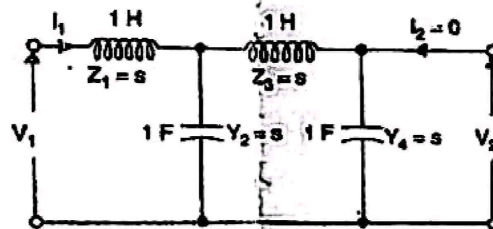


Figure 2

- Q. 2 Attempt any Two parts of the following. Q. 2(a) is compulsory.  
(a) What is a positive real function? Discuss. 3  
(b) Test whether following polynomial is a Hurwitz polynomial? 2  
 $p(s) = 2s^4 + 5s^3 + 6s^2 + 3s + 1$   
(c) Write the properties of L-C immittance functions. Draw a graph showing the variations of  $X(\omega)$  as  $\omega$  varies from 0 to  $\infty$ . 2

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B. Tech.  
(SEM IV) EVEN SEMESTER  
MAJOR EXAMINATION 2023 - 2024

NETWORK ANALYSIS AND SYNTHESIS

Time: 3 Hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carry equal marks.

(5 × 2 = 10)

1. Attempt any five parts of the following:

- (a) State and explain Thevenin's theorem.
- (b) State and explain Norton's theorem.
- (c) What are the short-circuit admittance parameters? Discuss.
- (d) Derive the conditions of symmetry for a two-port network in terms of its T-parameters.
- (e) For the network shown in following Figure 1 draw the oriented graph and its trees.

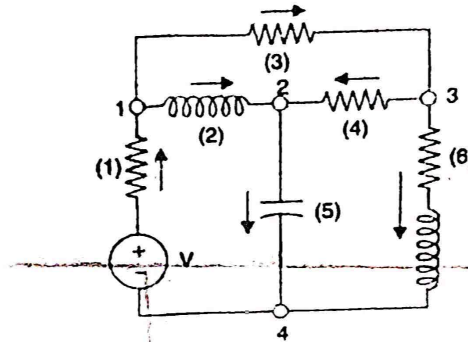


Figure 1

- (f) What is network function? Define and discuss in brief.
- (g) Test whether following polynomial is a Hurwitz polynomial?  
 $p(s) = s^5 + 12s^4 + 45s^3 + 60s^2 + 44s + 48$

2. Attempt any two parts of the following:

(2 × 5 = 10)

- (a) State and prove superposition theorem with suitable examples. Discuss its limitations.
- (b) State and explain the reciprocity theorem with a suitable example.
- (c) State and verify Tellegen's theorem for the circuit shown in Figure 2.

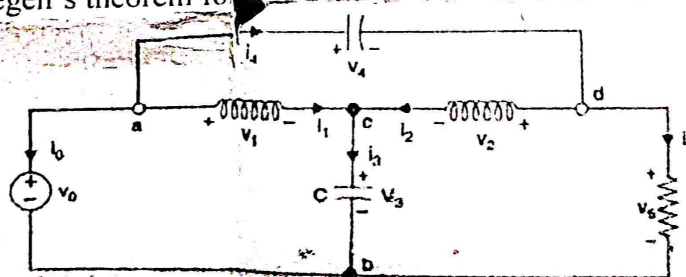


Figure 2

3. Attempt any two parts of the following:

(2 × 5 = 10)

- (a) Determine the open-circuit impedance and short-circuit admittance parameters of the network

shown in Figure 3.

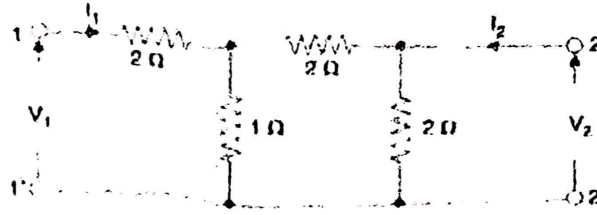


Figure 3

(b) For a two-port network, derive open-circuit impedance and short-circuit admittance parameters in terms of its transmission parameters.

(c) Discuss the cascade connection of two-port networks.

(2 × 5 = 10)

4. Attempt any two parts of the following:

(a) Consider an electrical network shown in Figure 1 same as in question 1(e), for its an oriented graph write the complete and reduced incidence matrices. Also write the properties of complete incidence matrices.

(b) What are the necessary conditions for driving point functions and transfer functions?

(c) Determine the driving point impedance function of the ladder network shown in the following Figure 4.

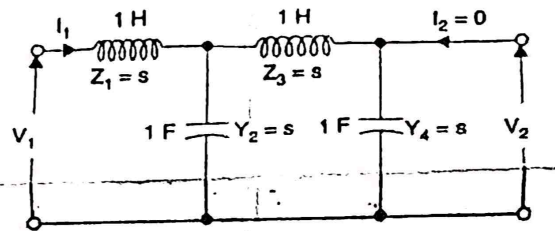


Figure 4

5. Attempt any two parts of the following:

(2 × 5 = 10)

(a) What is a positive real function? Define and write its properties.

(b) Discuss the Foster's synthesis method for LC driving point immittances.

(c) Given the driving point impedance function of an R-C network as

$$Z_D(s) = \frac{(s+1)(s+3)(s+5)}{s(s+2)(s+4)(s+6)}$$

Determine the Cauer-I and II forms of realizations.