



INDIA IN CHARACTER International Level in Excellence

B.Tech III Semester Regular/Supplementary Examinations, December 2025
NETWORK THEORY
 (ECE)

Maximum Marks: 60

Date: 19.12.2025

Duration: 3 hours

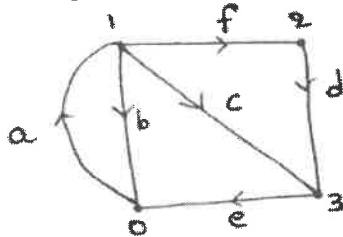
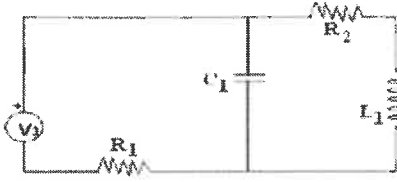
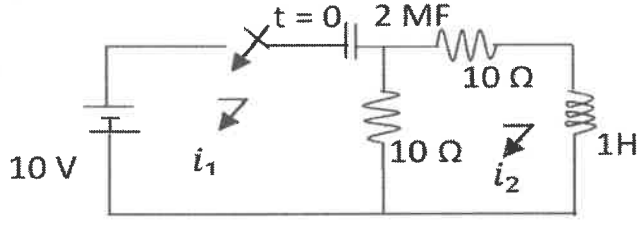
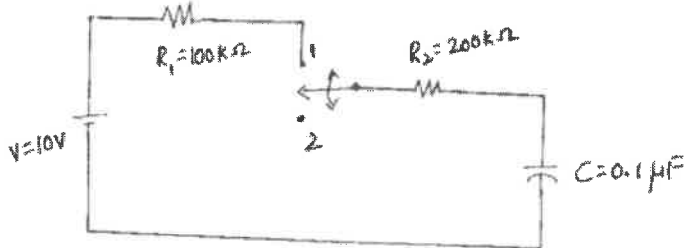
- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

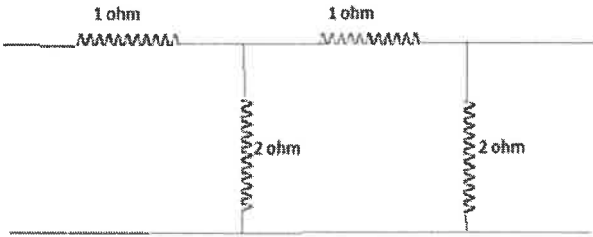
Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a)	How many twigs are there in a tree with N nodes?	1M	4	1
b)	Give the advantages and disadvantages of tie-set matrix.	1M	4	1
c)	Why is the transient response important in switching circuits?	1M	1	1
d)	List the three types of responses of RLC circuit	1M	1	1
e)	State the time-shifting property of Laplace Transform.	1M	2	1
f)	Write the Laplace Transform of $\delta(t)$.	1M	2	1
g)	Mention any two applications of two-port networks.	1M	3	1
h)	What is an active port?	1M	3	1
i)	Define quality factor (Q-factor) of a filter.	1M	4	1
j)	What is meant by a tuned filter?	1M	4	1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) For the given network graph, write down the basic Tie-set matrix taking a tree of branches e_1, e_3, e_5 . <div style="text-align: center; margin: 10px 0;"> </div> <p style="text-align: center;">Figure .1</p>	5M	4	2
		5M	4	2

	<p>b) For the graph shown in Figure.2 write the incidence matrix.</p>  <p>Figure .2</p>			
OR				
<p>3</p>	<p>a) Explain the conditions and procedure to obtain a Dual network. b) Draw the dual of the network as shown in the figure.3 check the dual circuit by comparing loop equations of the original and nodal equations of the dual network.</p>  <p>Figure.3</p>	<p>5M 5M</p>	<p>4</p>	<p>2</p>
<p>4</p>	<p>For the circuit shown in figure.4 the switch in closed at $t = 0$. Find the values of di_1/dt, di_2/dt and d^2i_2/dt^2 at $t=0+$.</p>  <p>Figure.4.</p>	<p>10M</p>	<p>1</p>	<p>3</p>
OR				
<p>5</p>	<p>For the circuit given in figure.5, the switch is closed on to position 1 initially at $t=0$sec. The switch is changed over to position 2 after 10 msec. Determine the voltage and current expression in both cases.</p>  <p>Figure.5</p>	<p>10M</p>	<p>1</p>	<p>3</p>

6	<p>a) Find the Laplace Transform of a triangular pulse defined as:</p> $f(t) = \begin{cases} t, & 0 \leq t \leq 1 \\ 2 - t, & 1 < t \leq 2 \\ 0, & t > 2 \end{cases}$ <p>b) A series RL circuit is exciting by a sinusoidal voltage source. The circuit is initially relaxed, and the switch is closed at $t = 0$. Derive the expression for the current response $i(t)$ using Laplace Transform.</p>	5M 5M	2	4
OR				
7	<p>a) Compute the response of an RC circuit using convolution when:</p> $h(t) = e^{-3t}u(t), \quad x(t) = u(t)$ <p>b) Using Laplace Transform, analyze a series RLC circuit excited by a step input and obtain Current response of the circuit.</p>	5M 5M	2	4
8	<p>a) The Z parameters of a two-port network are $Z_{11} = 10 \Omega$, $Z_{22} = 15 \Omega$, $Z_{12} = Z_{21} = 5 \Omega$. Find the equivalent T network and ABCD parameters.</p> <p>b) Draw the cascaded connection of two port network.</p>	5M 5M	3	5
OR				
9	<p>Derive the Z and Y parameters for the following network.</p> 	10M	3	3
10	<p>a) Design constant-k low pass filter.</p> <p>b) Design a m-derived of low pass filter(π-section) to cut off at 2Khz with a characteristic impedance of 600Ω and $f_{\infty} = 2.1\text{Khz}$.</p>	5M 5M	4	6
OR				
11	<p>Design a constant $-k$ high pass filter to cut-off at 5Khz with a characteristic impedance of 600Ω. Draw the π and T- sections of the high pass filter and show the circuit elements in each configuration.</p>	10M	4	6

