SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics & Communication Engineering
B. Tech. Major (Even Sem) Examination, 2025

Entry No: | | | | | | | | |

Total Number of Pages: [02]

Date of Exam: 25-07-2025

Total Number of Questions: [10]

Course Title: Network Analysis & Synthesis

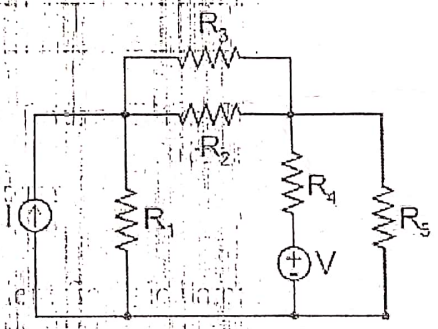
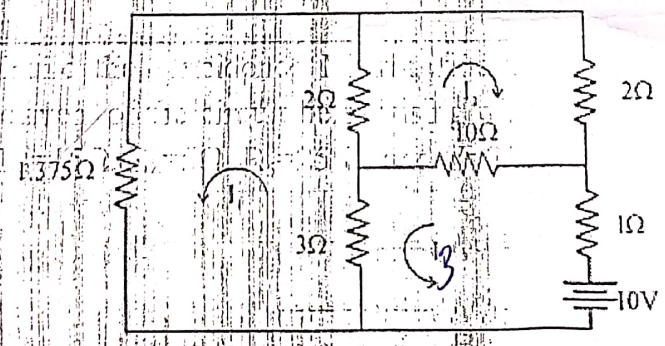
Course Code: ECL DC 104

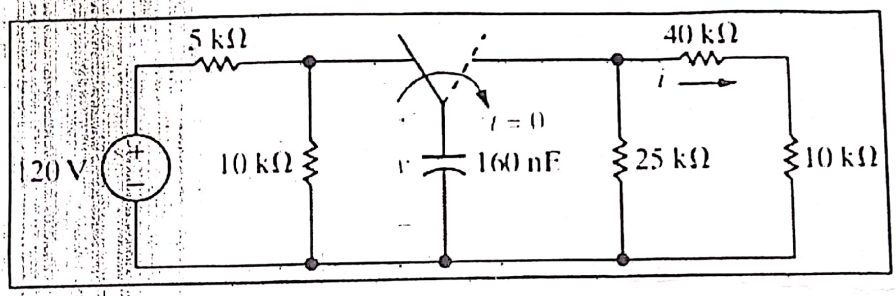
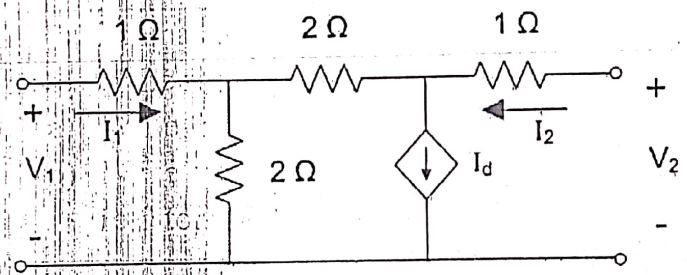
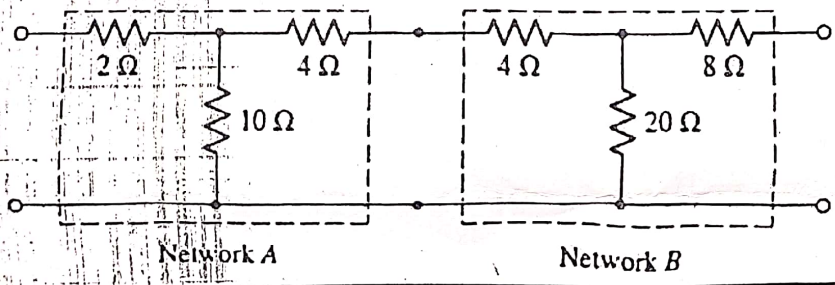
Time Allowed: 03 Hours

Max Marks: [40]

Instructions / NOTE

i. Attempt All Questions. Scientific Calculator is allowed in this paper.
ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.
iii. Assume any necessary or missing data or information.

Q. No.	Question	Marks	CO	KL
Q.1.	Build the Incidence Matrix, find the node voltages and branch current of the circuit below using where I=10 A, R_1=15Ω, R_2=10Ω, R_3=15Ω, R_4=5Ω, R_5=25 Ω, and V=25V 	4	CO1	3
Q.2.	Examine reciprocity theorem in the below circuit through Voltage sources 10V and resistance of 1.375 Ω. 	4	CO2	4
Q.3.	Solve the following differential equation using Laplace Transform $\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 5x = e^t$, where $x(0) = 1$ and $\dot{x}(0) = 2$	4	CO3	
Q.4.	A series RLC circuit consists of: R=10Ω, Inductance L=1 H, Capacitance C=0.01 F. Initially, the capacitor is charged to 5 V and the inductor has zero current. The circuit is disconnected from the power supply. **Questions:** (a) Write the expression for the capacitor voltage $v_c(t)$. (b) Find $v_c(t)$ at t=0.1 s.	4	CO3	

Q. 5.	The switch has been in the left position for a long time. At t=0 it moves to the right position and stays there. a) Write the expression for the capacitor voltage Vc(t) b) Write the expression for the current i(t) through the 40kΩ resistor 	4	CO
Q. 6.	Find the h parameter of the two port network where $I_d=6I_1$. 	4	C
Q. 7.	Find ABCD parameter for the cascaded network shown in the figure. 	4	C
Q. 8.	Check whether the polynomial is Hurwitz or not. $P(s)=4s^6+2s^5+17s^4+8s^3+16s^2+6s+3$	4	C
Q. 9.	Realize the following function using Foster's 2nd Form $Y(s) = \frac{s(s^2+16)}{8(s^2+4)(s^2+25)}$	4	C
Q. 10.	Classify various types of filters used in electrical networks.	4	C

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electronics & Communication Engineering
B. Tech. Minor Examination, 2024-25

Entry No: 2 4 B E C 0 5 5

Total Number of Pages: [01]

Date of Exam: 19-03-2025

Total Number of Questions: [05]

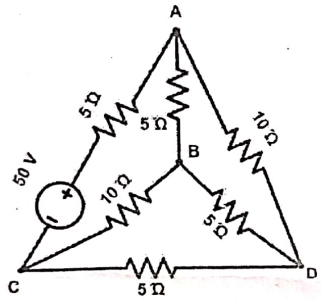
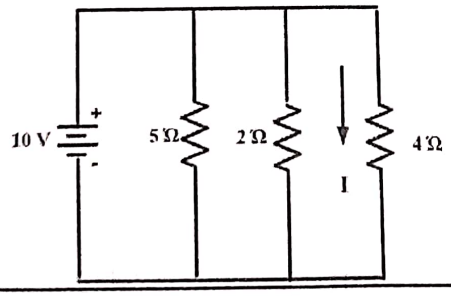
Course: Network Analysis & Synthesis
Course Code: ECL/DC104

Time Allowed: 90 Mins

Max Marks: [20]

Instructions / NOTE

i. Answer all questions.
ii. Marks are mentioned against each question.
iii. Support your answer with neat sketches/diagrams, wherever appropriate.

Q. No.	Question	Marks	CO	KL
Q.1.	**Construct** the tie-set matrix, and determine the loop currents, and branch currents for the given below circuit. 	6	1	6
Q.2.	State Duality principle and **examine** the Reciprocity theorem for given circuit. 	4	2	4
Q.3.	**Apply** inverse Laplace transformation: $L^{-1}\left(\frac{45}{s^2-100}+\frac{24s}{s^2-2500}+\frac{5}{s^2+9}+\frac{s}{s^2-25}+\frac{45}{(s+2)^2}\right)$	3	3	3
Q.4.	**Solve** y''-4y'+8y= te^{2t}, y(0)=2 and y'(0)= -2 using Laplace transformation method.	4	3	3
Q. 5.	In RC series circuit having a time constant of 2.5ms, the capacitor discharges with initial voltage of 100V. **Determine** the time at which the capacitor voltage reaches to (i) 45V (ii) 20V (iii) 2 V	3	3	5

Knowledge Level (KL): KL-1. Remembering, KL-2. Understanding, KL-3. Applying, KL-4. Analyzing, KL-5. Evaluating, KL-6. Creating

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of ECE/EE
B. Tech.(Branch)Minor -II Examination (Even) 2023-24

Entry No: | | | | | | | | | | **Total Number of Pages: [03]**

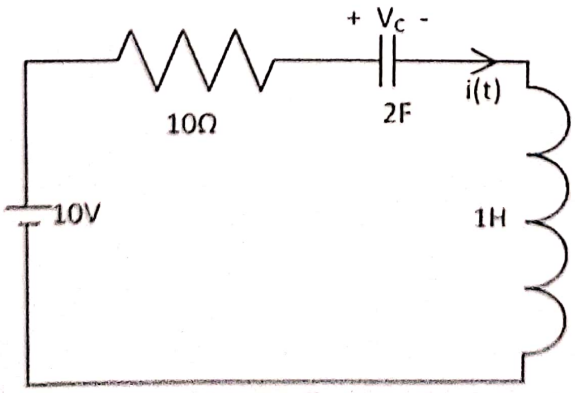
Date: 18-04-2024 **Number of Questions: [04]**

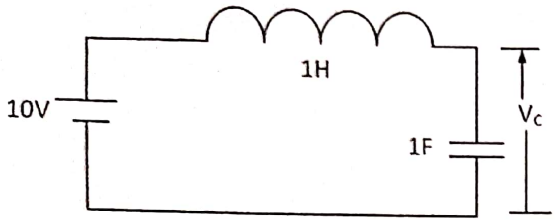
Course Title: Network Analysis and Synthesis
Course Code: ECL/EEL DC104

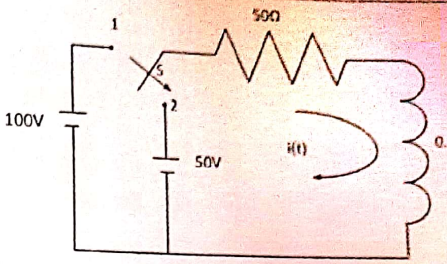
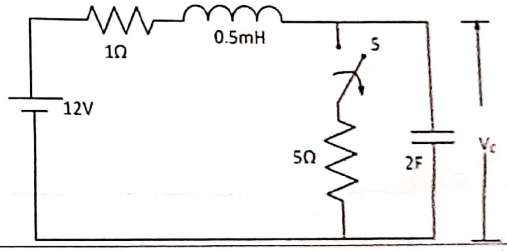
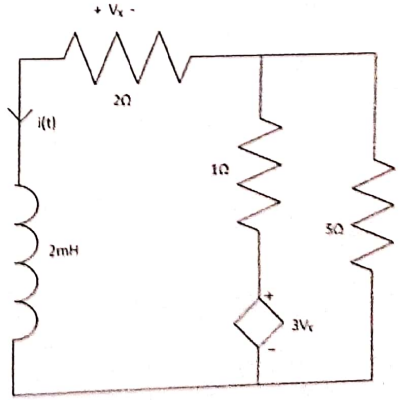
Time Allowed: 1.0 Hours(10:45-11:45 AM) **Max Marks: [20]**

Instructions / NOTE

i. Attempt All Questions.
ii. Assume an appropriate data / information, wherever necessary / missing.

Q1.	Mark the correct answer/fill up the blanks, wherever indicated for the following :	[01]	
	(a) For the circuit shown below (i) $V_c(\infty) = 10V$, $i_L(\infty) = 0A$ (ii) $V_c(\infty) = 0V$, $i_L(\infty) = 1A$ (iii) $V_c(\infty) = 0V$, $i_L(\infty) = 0A$ (iv) $V_c(\infty) = -10V$, $i_L(\infty) = 0A$		
			CO3
	(b) The voltage $V_c(t)$ in the circuit shown below will be of the following form (i) $K_1 \sin t + K_2 \cos t$ (ii) $K_1 e^{-t} + K_2 e^{-2t}$	[01]	

	(iii) Ke^{-t} sint (iv) Ktsint  (c) A circuit variable in a linear time invariant circuit has the form : $K_1e^{-t}+K_2e^{-2t}$. The circuit will have at least ---------- number of energy storing elements. (d) Plot the voltage waveform $v(t) = 1-e^{-2t}$.	[01] [01]	
	(e) The current in an ac circuit lags the voltage by an angle of 60°. If the frequency of the voltage and current is 50Hz, the positive peak of the current waveform will be delayed by ----------ms from the positive peak of voltage waveform.	[01]	
Q2.	In the RL circuit shown below, switch S is in position 1 long enough to establish steady state conditions and at t= 0,it is switched to position 2. Find the current i(t) for t ≥ 0.	[05]	CO3

	 		
Q3	The switch S was closed for a long time the circuit being in steady state, is opened at t = 0. Find the expression for the voltage $v_c(t)$ for t ≥ 0.  	[05]	CO3
Q4.	For the circuit shown below, determine the voltage $v_x(t)$ and the current i(t) for t≥0. Given that i(0)=2mA  	[05]	CO3

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of ECE/EE
B. Tech.(Branch)Minor –I Examination (Even) 2023-24

Entry No: | | | | | | | | | | **Total Number of Pages:[03]**

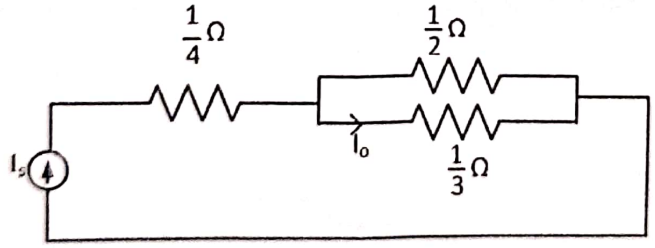
Date: 29-02-2024 (10:45-11:45 AM)
Total Number of Questions: [04]
Course Title: Network Analysis and Synthesis
Course Code: ECL/EEL DC104

Time Allowed: 1.0 Hours **Max Marks: [20]**

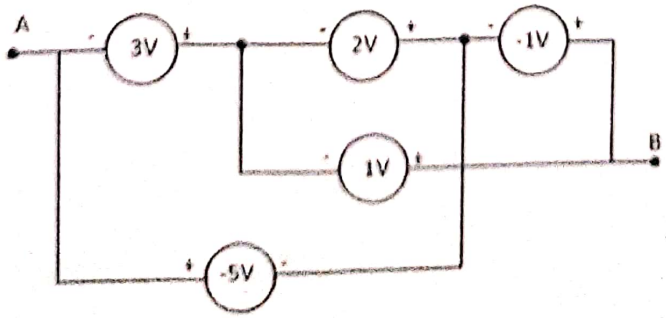
Instructions / NOTE

i. Attempt All Questions.
ii. Assume an appropriate data / information, wherever necessary / missing.

Q1. (i) A current source of value $I_s = 3\cos 2t$ is connected to the resistive network as shown below. Find the expression for the current I_o [01]



(ii) Replace the network of sources shown below with a single equivalent source . [01]



CO2

(i) Will the networks shown below in Fig. 1c and Fig. 1d produce the same current in The resistor R? If not, modify the network shown in Fig. 1d by making any necessary changes so that the currents will be same. Do not attempt to solve the network. [02]

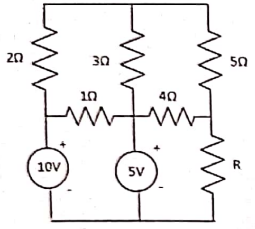


Fig. 1c

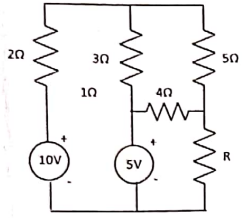
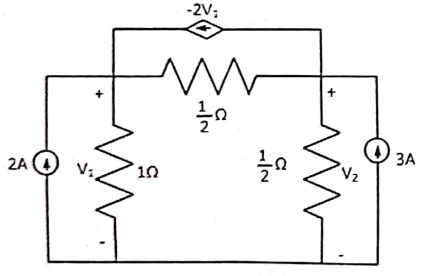
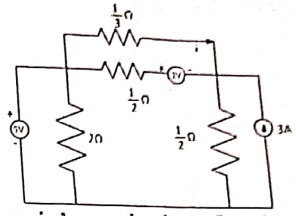


Fig. 1d

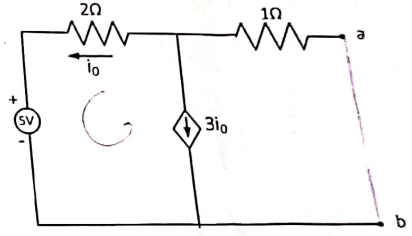
Q2. Find the indicated node voltages for the network shown below. [04] CO2



Q3 Using the principle of superposition determine the value of current 'i' in the network shown below. [04] CO2



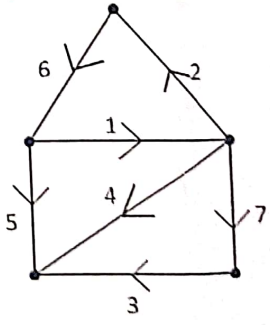
Q4. Find the Thevenin's equivalent for the network shown below as seen at terminals a-b. [04] CO2



Q5. For the oriented graph shown below in Fig. Q5 [04] CO1

(i) Develop the node to branch incidence matrix A_a.

(ii) For the specified tree comprising of the branches, {4, 5, 6, 7}, develop the fundamental cut-set matrix (Q) and the fundamental loop matrix (B)



SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA
School of Electrical Engineering
B. Tech.(EE/EC) Major Examination (II Sem.) May-2024

Entry No: 23bec68

Total Number of Pages: [04]

Date: 16-05-2024

Total Number of Questions:[13]

Course Title: Network Analysis and Synthesis

Course Code: EEL DC104

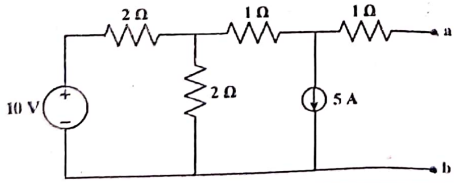
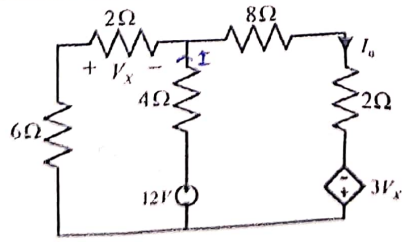
Time Allowed: 3.0 Hours **Max Marks: [50]**

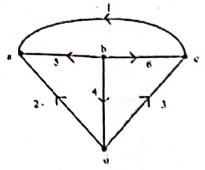
Instructions / NOTE

i. Answer of ALL questions of a particular section MUST be attempted at one place only. You may make three sections in your answersheet.

ii. Support your answer with neat freehand sketches/diagrams, wherever appropriate.

iii. Assume an appropriate data / information, wherever necessary / missing.

	Section-A (Attempt any two) **Q1.** For the circuit shown below, determine the Thevenin's equivalent voltage V_{th} and Thevenin's equivalent resistance R_{th} as seen at terminals a-b.  	05	CO1
	Q2. For the circuit shown below, find I_0.  	05	CO2
	Q3. An electrical circuit is represented by the	1+4	CO3



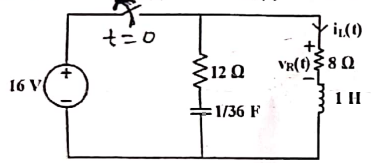
following oriented graph

(a)Determine the complete node-branch incidence matrix.

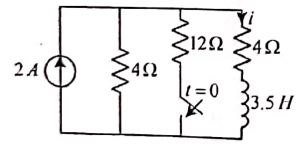
(b)Choosing the branches 4, 5, 6 as tree branches, determine the fundamental cut-set matrix [Q] and fundamental loop matrix B.

Section-B (Attempt any two) | 05 | CO3

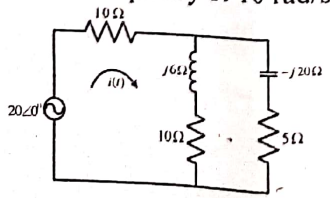
Q.4 If the switch in the figure shown below has been closed for a long time before t=0 but it opened at t=0, determine the current $i_L(t)$ and $v_R(t)$ for $t \geq 0$



Q.5 Obtain the inductor current i(t) for t>0 in the circuit shown below. The circuit was in steady state at $t=0^-$. | 05 | CO4

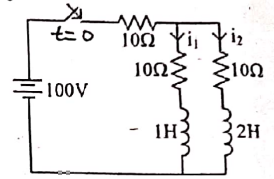


Q.6 Obtain an expression for the instantaneous value of the current i(t) in the sinusoidal steady state. The voltage source has a frequency of 10 rad/sec. | 05 | CO5

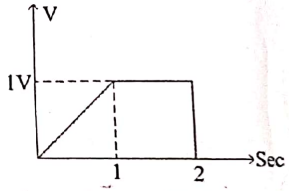


Section-C (Attempt any 5) | 06

Q7. In the network shown, the switch 'k' is closed at t=0 with the network previously unenergized. For the element values shown on the diagram (a) Find $i_1(t)$, (b) $i_2(t)$ for $t \geq 0$, using the method of Laplace transforms analysis.



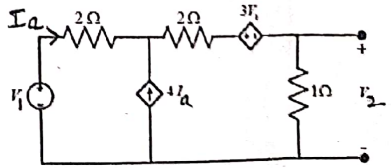
Q8.(a) Determine the Laplace transform of the voltage waveform shown below. | 3+3



(b) Determine the voltage v(t) for a circuit for which the expression of the Laplace transform of the voltage V(s) is given by

$$V(s) = \frac{s^2 + 2s + 1}{(s+2)(s^2+4)}$$

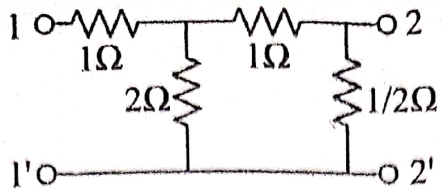
Q9. (a)Determine Transfer function $\frac{V_2}{V_1}$ for the network shown below | 4+2



(b) An LTI network has the following poles and zeros for specified transfer function :

The Zeros: $(-1+j_1), (-1-j_1), -2$; Poles: $-1, -2, -3$ the scale factor is K. Write down the expression for the specified transfer function.

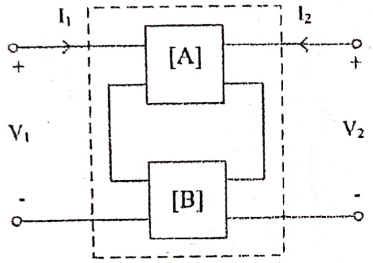
Q10. Determine the Z-parameters for the resistive circuit shown below. | 06



Q11. Two, different two-ports, 'A' and 'B' are represented by the following characterization:

Port A: $[Z] = \begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix}$, Port B: $[Y] = \begin{bmatrix} 1 & 5 \\ 5 & 4 \end{bmatrix}$

If these two ports are interconnected as shown in the figure given below, determine the [Z]parameters of the equivalent two-port.



06 CO4

Q12.(a) Identify the impedance function from amongst the given immittance function which represent(i)LC impedance(ii)RL admittance

(i) $\frac{(s+1)(s+2)}{s(s+1.5)}$ (ii) $\frac{(s^2+1)(s^2+3)}{s(s^2+2)(s^2+4)}$ (iii) $\frac{(s+1)(s+2)}{s(s+3)}$

(iv) $\frac{(s^2+1)(s^2+2)(s^2+4)}{s(s^2+3)}$ (v) $\frac{s^3+3s+2}{s(s^2+2)}$

(b) Synthesize the LC impedance function identified in 12(a) in Foster-I form.

2+4 CO3

Q13.(a) List the properties of LC impedance functions using which it can be identified.

(b) Synthesize the following impedance function in Cauer-I form,

$$Z(s) = \frac{s^4 + 40s^2 + 144}{s^3 + 25s}$$

2+4 CO3