R. N. G. PATEL INSTITUTE OF TECHNOLOGY,

ISROLI -TAJPORE, BARDOLI (RNGPIT)-084

Department of Electrical Engineering

Subject: **ELECTRICAL CIRCUIT ANALYSIS (3130906)**

B.E. – Second year [Third Semester]

Branch – Electrical Engineering 2022

Term: 23/1 (Aug.23 To Dec.23)

Faculty: Dr. S. A. Shaikh

Prof. S.D.Patel

Contents:

Instructions for Assignment/Tutorial:

[1] This set of Assignment-Tutorial consist the collection of questions of past GTU Question papers.

[2] Attend those questions which are **bold marked** and/or frequently asked in GTU exam.

[3] Students should make a separate Chapter wise Files [**write on File Pages**] to solvethese Questions.

[4] Students must solve these given set of Assignments by themselves only.

[5] Assessment of given assignment should be done regularly after completion of each chapter by Students from the respective faculty members.

1. Course Outcomes:

After learning the Circuits and Networks course, student will be able to……..

Sr No.	Chapter Name	Course Outcomes (CO)
Chapter-1	**Network Theorems** Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks	CO-2 : Analyze the circuit using Kirchhoff's law and Network simplification theorems CO-1 : Apply the knowledge of basic circuital law and simplify the network using reduction techniques
Chapter-2	**Solution of First and Second order networks** Solution of first and second order differential equations for Series and parallel R-L, R-C, RLC circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response	CO-3 : Infer and evaluate transient response, Steady state response, network functions
Chapter-3	**Sinusoidal steady state analysis** Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer	
Chapter-4	**Electrical Circuit Analysis Using Laplace Transforms** Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances	CO-4 : Obtain the maximum power transfer to the load , and Analyze the series resonant and parallel resonant circuit
Chapter-5	**Two Port Network and Network Functions** Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and	CO-5 : Evaluate two-port network parameters.

	hybrid parameters, interconnections of two port networks	

2. Course Contents:

CHAPTERS	COURSE CONTENT	TOTAL HRS	%WEIGHTAGE
Chapter-1	**Network Theorems** Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks	10	20
Chapter-2	**Solution of First and Second order networks** Solution of first and second order differential equations for Series and parallel R-L, R-C, RLC circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response	8	20
Chapter-3	**Sinusoidal steady state analysis** Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer	8	20
Chapter-4	**Electrical Circuit Analysis Using Laplace Transforms** Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances	8	20
Chapter-5	**Two Port Network and Network Functions** Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks	8	20

3. List of Reference Books:

1. **Circuits and networks, U.A.Patel, Mahajan Publication**
2. **Circuits and networks, U.A.Bakshi, Technical Publication**
3. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
4. A. A. Nimje and D. P. Kothari, "Electrical Circuit Analysis and synthesis", New Age International Publications, 2017
5. K.S.Suresh Kumar, "Electric Circuit Analysis", Pearson Publications, 2013.
6. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.
7. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
8. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
9. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

1. List of Experiments:

SR. NO.	LIST OF EXPERIMENTS
1	TO MEASURE AND CALCULATE CURRENTS AND VOLTAGES FOR A GIVEN RESISTIVE CIRCUIT AND VERIFY KCL& KVL.
2	TO VERIFY THE SUPERPOSITION THEOREM.
3	TO STUDY AND VERIFY THE THEVENIN'S THEOREM.
4	TO STUDY AND VERIFY THE NORTON'S THEOREM.
5	TO VERIFY THE RECIPROCITY THEOREM.
6	TO VERIFY THE MAXIMUM POWER TRANSFER THEOREM.
7	TO VERIFY MILLMAN'S THEOREM.
8	TO OBTAIN Z, Y, HYBRID & ABCD PARAMETERS IN TWO PORT NETWORK.
9	TO OBTAIN TIME RESPONSE OF SERIES RC CIRCUIT.
10	TO OBTAIN TIME RESPONSE OF SERIES RL CIRCUIT.

2. Major Equipment's required for Experiments:

1	Portable Moving Coil Type Meters (D.C) VOLT METERS (0 - 15 -30 Volts)
2	Portable Moving Coil Type Meters (D.C) AMMETERS (0 -250- 500 Mili Amp)
3	Portable Moving Coil Type Meters (D.C) AMMETERS (0 – 50-100 Mili Amp)
4	Digital Multimeter
5	Digital Storage Oscilloscope
6	KCL and KVL Kit
7	Superposition Theorem Kit
8	Thevenin's Theorem Kit
9	Norton's Theorem Kit
10	Two port Network Kit
11	Maximum Power Transfer Theorem Kit
12	Reciprocity Theorem Kit
13	Millman's Theorem Kit
14	Response characteristics (Time constant) of RC network (low pass and high pass) Kit
15	Response characteristics (Time constant) of RL network (low pass and high pass) Kit

3. List of Open source software and learning websites required for experiments:

LIST OF SOFTWARE:

Multisim (**Open Source Software)**

LEARNING WEBSITE SOURCE:

www.nptel.ac.in, www.allaboutcircuits.com Courses available through NPTEL.
website : nptel.ac.in

7.Learning Assignments:

Chapter-1	**Network Theorems** Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks **Book : Circuits and networks, U.A.Patel, Mahajan Publication**

ATTEMPT ALL BOLD QUESTIONS.

SR. NO.	QUESTIONS	YEAR	MARKS
1.	**Explain KCL and KVL using suitable example.**	**March-10**	**07**
2.	Which law is used to formulate the network equations in nodal analysis? (KCL /KVL /Thumb rule /None of these)	Jan-16	01
3.	Briefly describe the nodal analysis with a small example.	Jan-16	04
4.	Which analysis is more suitable if the number of nodes in the network is less than the number of meshes?	Jan-17	01
5.	Briefly explain the mesh analysis.	Jan-17	03
6.	Differentiate between mesh analysis and nodal analysis	Jan-17	04
7.	Super position theorem is applicable to_____network. (A) Linear (B) Bilateral (C) Linear and Bilateral (D) None of these	June-16 May-17	01
8.	**Briefly describe superposition theorem.** **State and explain Superposition theorem.**	**Jan-17** **Nov-17** **May-18** **June-19**	**03** **03** **03** **07**
9.	Discuss substitution theorem and steps for solution of a network using this theorem.	Dec-13 Jan-15	07
10.	Write the statement of Norton'stheorem	Jan-17	01
11.	State and explain Norton's Theorem with suitable example.	June-16	07
12.	**State and explain (i) Thevenin's theorem and (ii) Norton's theorem in brief giving suitable examples.**	**Dec-09** **May-12** **June-13** **July-23**	**06** **04**
13.	**State and explain (i) Reciprocity theorem (ii) Norton's Theorem.**	**Dec-11** **Jan-15** **June-14**	**07**
14.	State and explain Reciprocity Theorem and Millman Theorem.	June-16	07

15.	**State and explain the maximum power transfer theorem. Derive the condition for maximum power transfer to the load for d.c. circuits & ac circuits.** **State, Prove and Summarize conditions for Maximum power transfer in DC circuit and different case in AC circuit.** State and explain the Maximum Power Transfer Theorem. Drive the condition for maximum power transfer to the load for DC and AC circuit.	**Dec-09** **May-12** **June-14** **June-15** **Jan-15** **June-16** **May-17** **Nov-17** **May-18** **Nov-18** **June-19**	**06** **03** **03** **07** **07** **07**
16.	Prove the maximum power transfer theorem for a practical voltage source (Vs, Rs). State and prove maximum power transfer theorem.	May-11 Jan-16	05 08 07
17.	Write the statement of maximum power transfer theorem. State and explain maximum power transfer theorem.	Jan-16 May-18 June-19	01 03 03
18.	Compare Thevenin theorem and Norton theorem.	**Nov-18**	**07**
19.	State and explain Thevenin's theorem	June-19	03
20.	State and explain Superposition theorem.	**Sept 2021**	**03**
21.	For the electrical network shown in **Figure 1**, find the value of unknowncurrent I_1, I_2 and I_3 using the mesh analysis technique	**Sept 2021**	**04**
22.	The network shown in **Figure 2** contains the dependent source and an independent source. Find the Norton's equivalent circuit across terminals Aand B	**Sept 2021**	**07**
23.	State and explain Superposition theorem for the solution of electricalnetwork.	**Feb2022**	**03**
24.	State and explain Reciprocity theorem for the solution of electricalcircuits.	**Feb2022**	**04**
25.	Determine the current through j5Ω using superposition theorem ofnetwork shown in Fig.A	**Feb2022**	**07**
26.	Calculate the voltage across 5Ω resistor using mesh analysis for a figure.B.	**July 2023**	**07**
27.	Explain the concept of duality and derive the dual network for series RLC circuit shown in figure.C.	**July 2023**	**03**
28.	Calculate the unknown node voltages V1,V2 and V3 shown in figure D, using node analysis.	**July 2023**	**07**
29.	A Wheatstone bridge shown in figure.E ABCD is arranged as follows: AB =10Ω, BC = 30Ω, CD = 15Ω and DA = 20Ω. A 2V battery of internal resistance2Ω is connected between points A and C with A being positive. A galvanometer of resistance 40Ω is connected between B and D. Find the magnitude and direction of the galvanometer current as per given branch currents.	**July 2023**	**07**

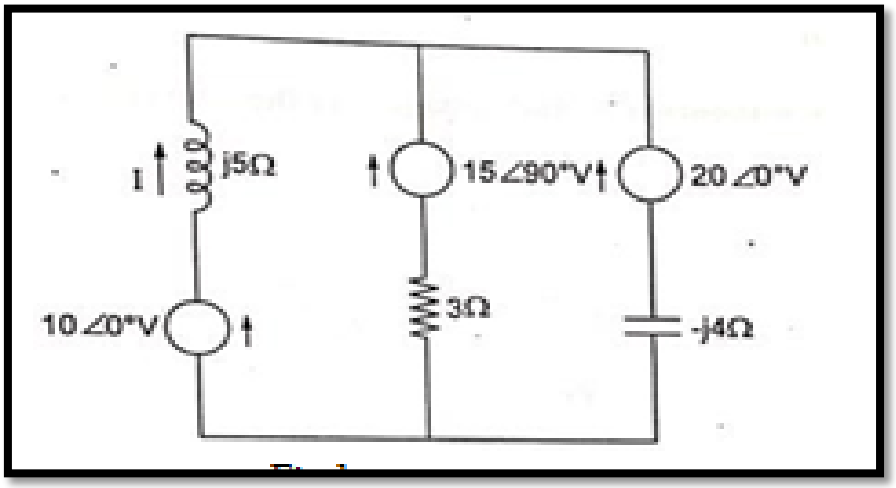
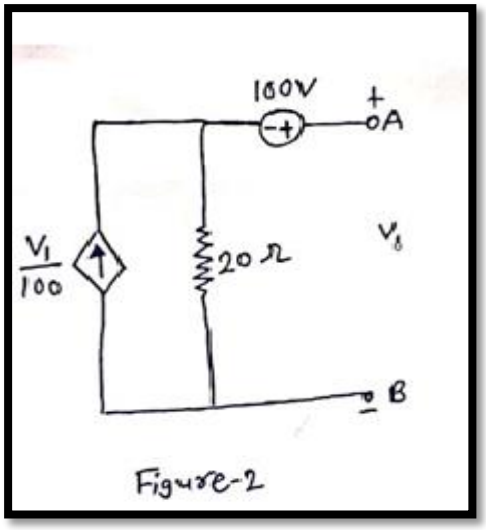
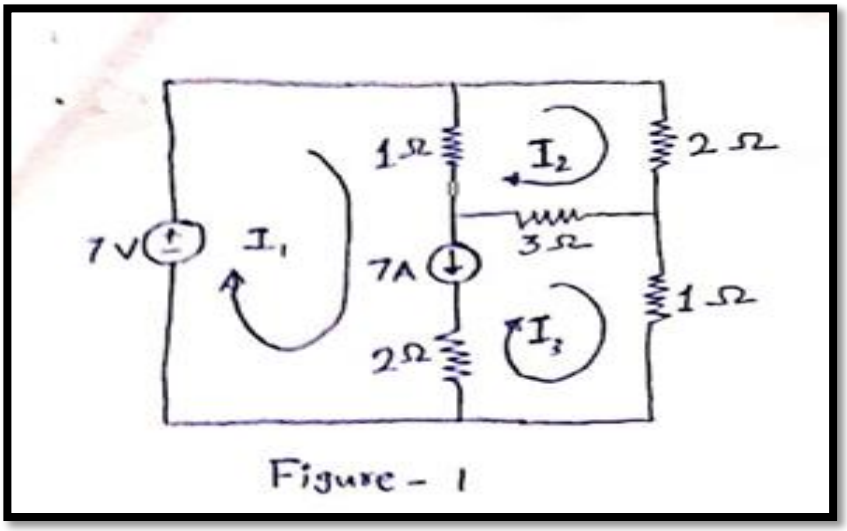


Fig-A





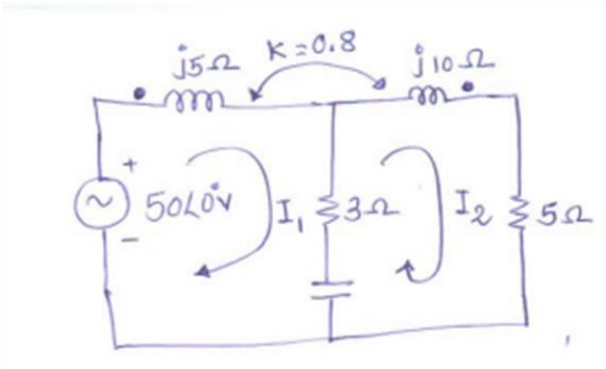


Figure B

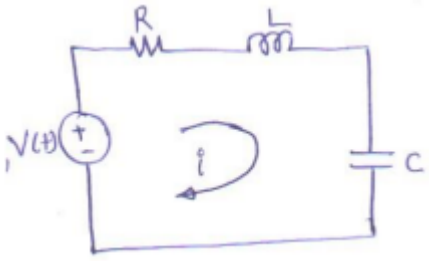


Figure C

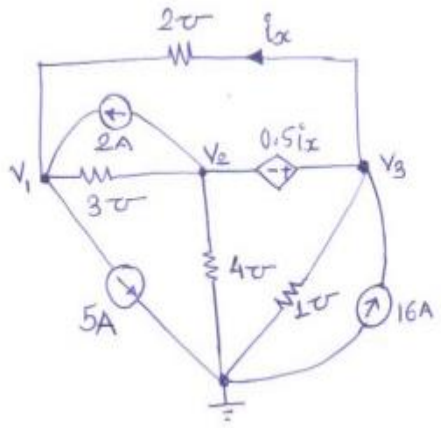


Figure D

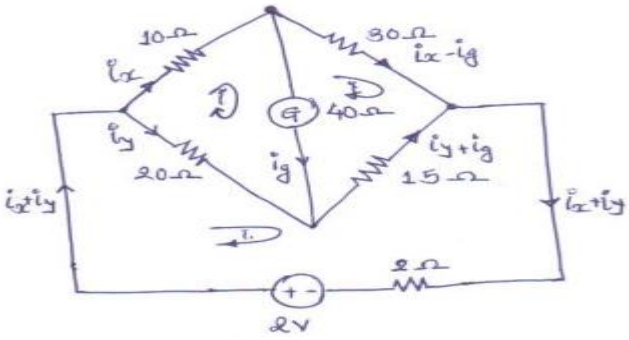


Figure E

Chapter-2	**Solution of First and Second order networks** Solution of first and second order differential equations for Series and parallel R-L, R-C, RLC circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response. **Book : Circuits and networks, U.A.Patel, Mahajan Publication**

ATTEMPT ALL BOLD QUESTIONS.

SR. NO.	QUESTIONS	YEAR	MARKS
1.	**What are the relationship between voltage and current in resistor, inductor and capacitor? Also mention the initial and final condition for R,L and C components in the different cases.** **How inductor and capacitor will behave at t = 0 and at t = ∞.** **Draw equivalent networks.** **State the Initial and final condition of R,L and C at t=0+ and t=∞. (Initially all are uncharged and put across the source).** **What is significance of initial condition? Write initial conditions for *R*, *L* and *C* at *t=0+* and at *t*=∞.** **Discuss initial conditions in basic elements of network.** State the voltage and current relationships in resistor, inductor and capacitor. Also, state the initial and final conditions for resistor, inductor and capacitor for the different conditions.	**June-14** **June-15** **May-18** **Dec-09** **June-13** **May-18** **May-12** **June-15** **Jan-16** **June-16**	**07** **02** **07** **3.5** **04** **07** **07** **07**
2.	Justify: The inductors act as an open circuit at time t = 0+	June-16 May-17	01
3.	Write the initial conditions for the inductor and capacitor at t = 0+ and t = ∞.	June-16 May-17 June-19	03 07 03
4.	Which of the following statement is correct in relation to inductor as a circuit element? Consider VL as voltage across the inductor and IL as current through the inductor. (A) Both VL and IL can change instantaneously (B) Neither VL nor IL can change instantaneously (C) IL can change instantaneously but VL cannot (D) VL can change instantaneously but IL cannot	Jan-16	01
5.	Justify: the current in an inductor and voltage across a capacitor cannot change instantaneously.	June-15	07
6.	Which of the following statement is correct in relation to capacitor as a circuit element? Consider VC as voltage across the capacitor and IC as current through the capacitor. (A) Both VC and IC can change instantaneously (B) Neither VC nor IC can change instantaneously (C) IC can change instantaneously but VC cannot (D) VC can change instantaneously but IC cannot	Jan-17	01
7.	**Describe the steps to evaluate the initial conditions of a network.**	**Jan-16**	**03**
8.	Briefly describe the rules for initial conditions calculation of various circuit elements.	Jan-17	07
9.	Explain the particular integral and complementary function solution of a first order non-homogeneous equation.	June-16	07
10.	**What do you mean by a first order system? Give two examples of first order systems. Explain the procedure to obtain the**	**Jan-16** **Jan-17**	**07**

	transient response of a first order system.		
11.	What is time-constant of R-L circuit? Derive the circuit equations for a series R-L circuit connected to a DC supply.	May-18	07
12.	What is time constant? What is its significance?	May-18	03
13.	Show the graph of current through series RL circuit connected to a step input.	Jan-17	01
14.	**Explain how to determine the initial conditions in an RL network and the current i(t) based on these conditions.**	**May-11**	**07**
15.	**Derive expression for rise of current and decay of current in RL series circuit excited by DC voltage source. Discuss the role of time constant in each.** **Derive the equation of inductor current and draw its waveform for a series R-L circuit connected to a step input voltage.**	**March-10** **Jan-16**	**07** **04**
16.	**Obtain the response V_C (t) and I_L (t) for the source free RC and RL circuits respectively. Assume initial voltage V_0 and initial current I_0 respectively.**	**Dec-10**	**07**
17.	**What is time constant? Define the time-constant of RL and RC networks and explain the significance of the time-constant.** **What is time constant? Explain time constant in terms of RL and RC circuit**	**June-15** **May-11** **June-19**	**07** **07**
18.	Draw a circuit diagram using any of the components (R, L, C and Active source) for a first order system of your choice.	Jan-16	01
19.	Classify DC responce of first order RL and RC circuits	**Nov-18**	**07**
20.	Derive the expression for rise of current and decay of current in R-L series circuit excited by d.c. voltage source.	June-19	07
21.	Explain the procedure to obtain sinusoidal steady state response of a circuit.	Jan-16 June-19	07 07
22.	What do you mean by a second order system?	Jan-17	01
23.	**Derive necessary derivations for source free series R-L-C circuit**	**June-14**	**07**
24.	Explain the time response of R-L-C series circuit with step input. Assume critically damped system.	Jan-17	04
25.	**If a step input voltage is given to an L-C series circuit (there is no resistance), what is the waveform of current passing through the circuit?**	**Jan-16** **Jan-17**	**01**
26.	Analyze time domain responce of source free second order linear networks	Nov-18	07
27.	Analyze time domain responce of second order linear networks with constant inputs	Nov-18	07
28.	Explain the step response to R- L- C series circuit and Hence derive the formula for loop current i(t) in series R-L-C circuit.	June-15	07

29.	The circuit shown in Fig **CC** consists of a resistor and a relay with inductance (L). The relay is adjusted in such a way that it is actuated when the current through the coil is 8 mA. The switch is closed at t=0 and it is observed that the relay is actuated when t = 0.1 sec. Determine(a) the value of L and (b) the equation of current.	**Feb-22**	**07**
30.	**Point out the relations between voltage and current for the following passive elements. (1) Resistor (2) Capacitor.**	**Feb -22**	04
31.	In the given circuit shown in **Figure 3**, capacitor C has initial voltage $V_c(0^-)$=5V and at the same time current through inductor L is zero. Obtain thedv(t)/dt at $t=0^+$ if the switch K is closed at the time t=0 sec.	**Jan-21**	**07**
32.	In the circuit shown in **Figure 4**, a d.c. voltage of 10 volts is suddenly applied by closing switch to a series circuit consisting of resistor R=10Ω, inductor L=1H and capacitor C=0.04F. Obtain the expression of current *i(t)* for t>0	Jan-21	07
33.	For the network shown in **Figure 5**, obtain the expression of current $i_1(t)$ and $i_2(t)$ for t>0. Consider switch K is closed at t=0 sec.	Jan-21	07
34.	Make a table for the transfer impedances for R,L and C.	July 23	03
35.	Calculate the step response for series R-C circuit for t>0	July 23	04
36.	For a given figure.6 inductor current and capacitor voltage is zero at t=0- ,so for a given network show that its generated current transform is $I(S)$ = $10(s\ 2+s+1)/\ (s\ 2+1)(s\ 2+2s+1)$	July 23	07
37.	In the network shown in figure.7 calculate the current i(t) ,when $i1(t)=7e^{-6t}\ A$ for t≥0, i(0) =0, also find out i(ω) using Laplace transforms.	July 23	07

Fig CC

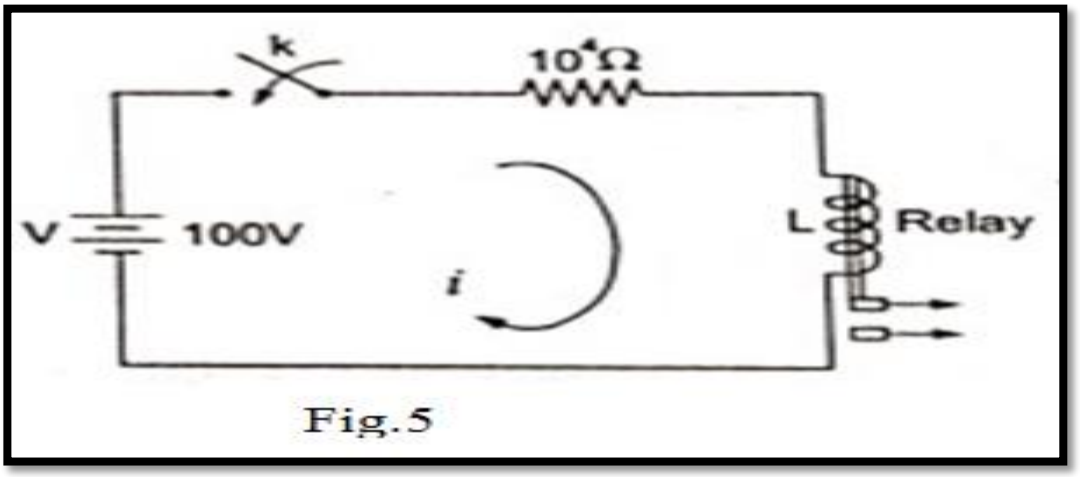


Fig.5

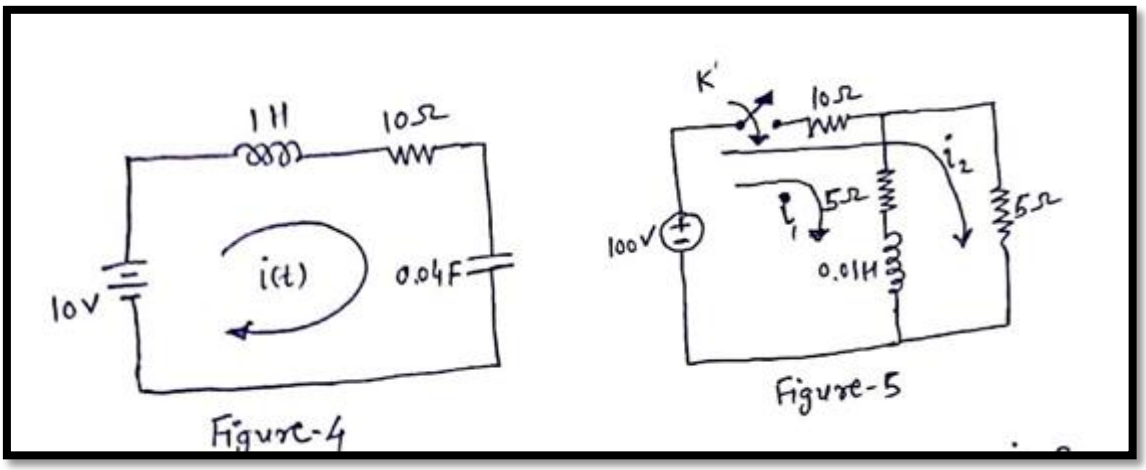


Figure-4

Figure-5

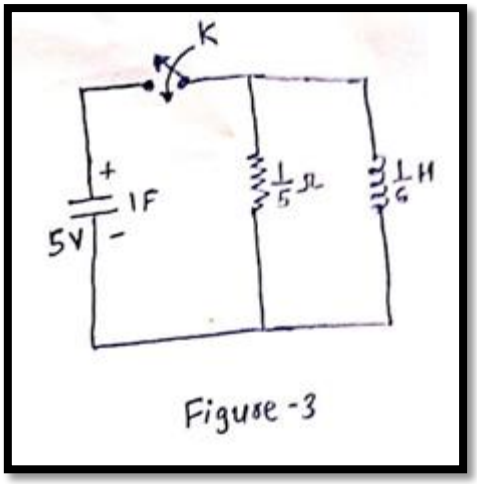


Figure -3

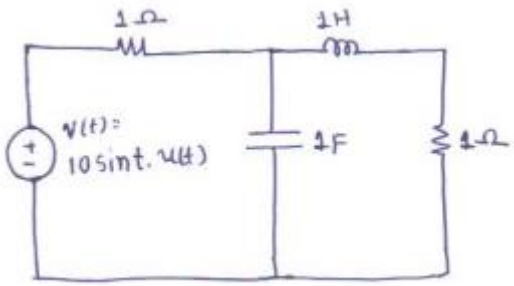


Figure:-6

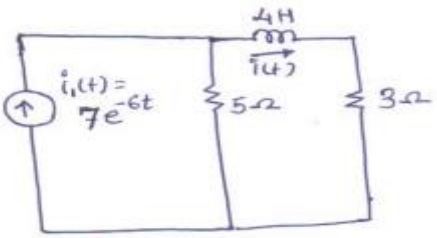


Figure 7

Chapter-3	**Sinusoidal steady state analysis** Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer. **Book : Circuits and networks, U.A.Patel, Mahajan Publication**

ATTEMPT ALL BOLD QUESTIONS.

SR. NO.	QUESTIONS	YEAR	MARKS
1.	**Show that two magnetically coupled coils connected in parallel can be replaced by a single coil having an inductance of (a) $L_{ab} = \frac{L1L2-M^2}{L1+L2-2M}$ (b) if magnetic polarity of the coil 2 is reversed then $L_{ab} = \frac{L1L2-M^2}{L1+L2+2M}$**	**Dec-13**	**07**
2.	**Explain the "Dot Convention Rule" for the magnetically coupled Network. Explain the method to put the Dots on different linked Coils using suitable example**	**May-12 June-14 Nov-17 May-18**	**07**
3.	Define self and mutual inductance with dot convection method	**Nov-18**	**07**
4.	**Define the term (i) RMS values (ii) Apparent power (iii) Complex power.**	**Sept-2021**	**03**
5.	**For the circuit diagram shown in Figure 6, obtain the impedance Z_{eq} andadmittance Y_{eq}**	**Sept-2021**	**07**
6.	**In the network shown in Figure 7, determine the voltage V which results ina zero current through the impedance 2+j3Ω**	**Sept-2021**	**07**
7.	**Explain in brief about the ideal transformer.**	**Sept-2021**	**03**
8.	Explain the dot rule for mutually coupled circuit using the suitable example	**Sept-2021**	**04**
9.	For the network shown in **Figure 8**, a three-phase, three-wire, balancedABC system, with an effective line voltage of 120 V, has three impedances of $5\angle 45^{\circ}\ \Omega$ in a ▲(delta) connection. Determine the line currents and drawthe phasor-diagram showing the voltage, current relationship.	**Sept-2021**	**07**
10	Why the current in inductor and voltage in capacitor cannot changesimultaneously?	**Feb-2022**	**03**
11.	Explain and derive the step response to R-L series circuit using LaplaceTransformation method	**Feb-2022**	**04**

12.	Construct the exact dual of the network of **Fig-AA**	**Feb-2022**	**07**
13.	Point out the relations between voltage and current for the following passive elements. (1) Resistor (2) Capacitor.	**Feb-2022**	**03**
14.	Give details of the procedure to obtain sinusoidal steady state response of a circuit	**Feb-2022**	**04**
15.	The circuit shown in **Fig. BB** consists of a resistor and a relay with inductance (L). The relay is adjusted in such a way that it is actuated when the current through the coil is 8 mA. The switch is closed at t=0 and it is observed that the relay is actuated when t = 0.1 sec. Determine (a) the value of L and (b) the equation of current.	**Feb-2022**	**07**
16.	For a given figure.CC find out the i1(0+) and iL(0+), the network has been achieve the steady state at t	**July 2023**	**04**
17.	In the circuit shown in figure.DD, a 10 volt d.c.supply is suddenly applied to series circuit. The capacitor is initially uncharged. Obtain the particular solution for the current i(t) in the circuit.	**July 2023**	**07**

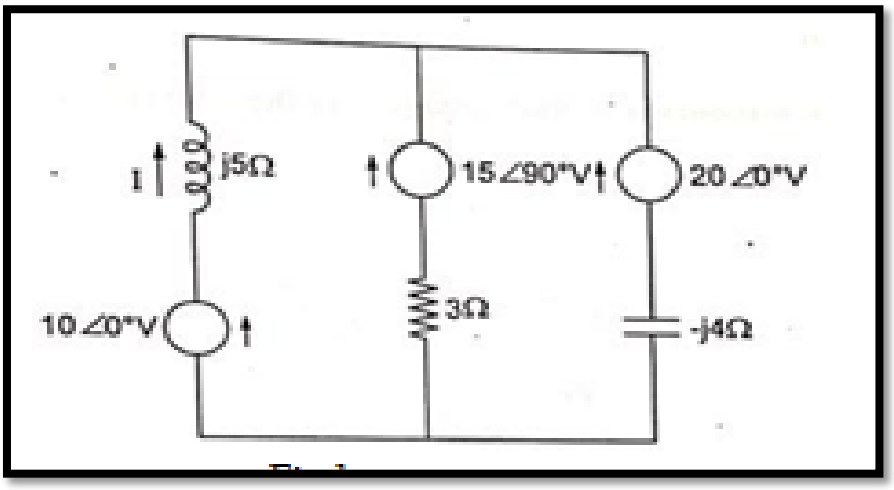


Fig AA

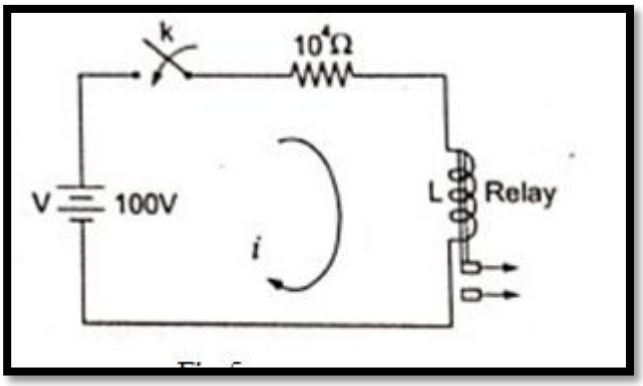


Fig BB

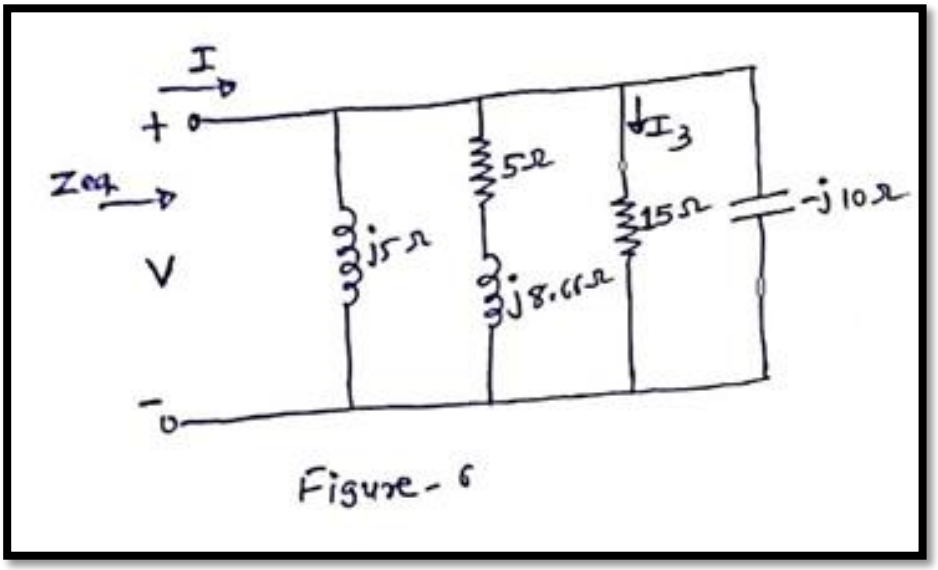


Figure-6

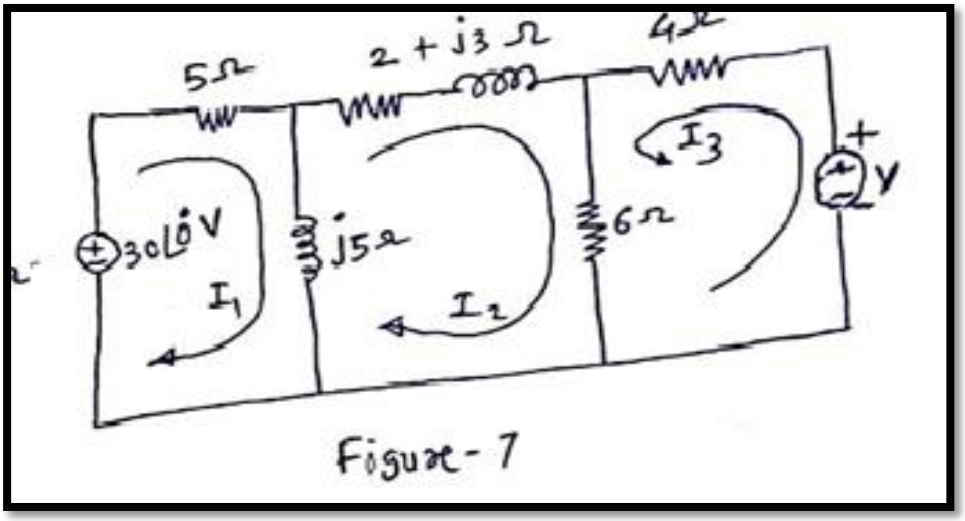


Figure-7

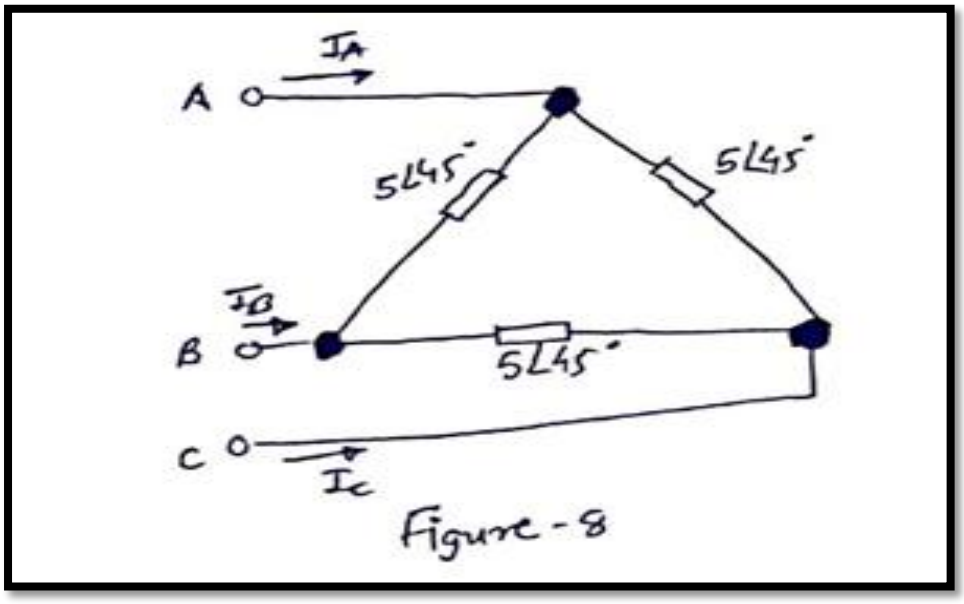


Figure-8

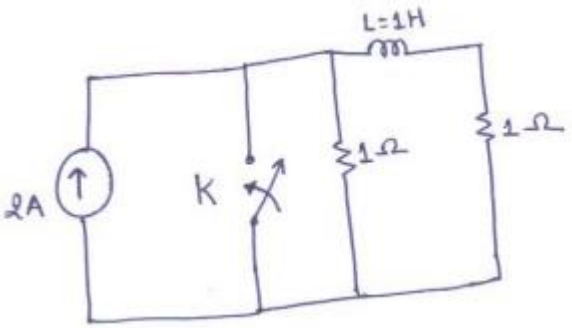


Figure CC

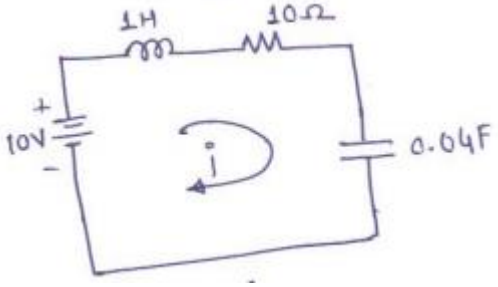


Figure DD

Chapter-4	**Electrical Circuit Analysis Using Laplace Transforms** Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances **Book : Circuits and networks, U.A.Patel, Mahajan Publication**

ATTEMPT ALL BOLD QUESTIONS.

SR. NO.	QUESTIONS	YEAR	MARKS
1.	**State the procedure to obtain solution of a network using Laplace transform technique. State its advantages over classical method.** **Describe Laplace transformation method for solving differential equations. State its advantage over the classical method.** **Describe Laplace transformation method for solving differential equations, State its advantage over the classical method.**	**June-15** **May-18** **May-18** **June-16** **Nov-17** **Jan-15** **Dec-11**	**06** **04** **07** **07** **07** **07**
2.	State the procedure to obtain the solution of Laplace Transform Technique. State its advantages over classical method. State only Initial and Final value theorem.	Dec-09 March-10 May-12	**07**
3.	**State the final value theorem of Laplace Transform Under what conditions the final value theorem cannot be used? Give one example.** **Under what conditions, the final value theorem cannot be used? Explain with example.**	**Dec-13** **Jan-16**	**07** **07**
4.	**State and explain the initial and final value theorem.** **State and explain initial value theorem.** **State and explain initial value theorem.** **State and explain initial value theorem.** **State and give the proof of the initial and final value theore.** **State and explain initial value theorem.**	**June-14** **June-16** Nov-18 **May-17** **Nov-17** Nov-17 June-19	**07** **03** **03** **03** **03** 07 03
5.	**What is transfer function?**	**June-16** **May-17**	**01**
6.	Write down voltage and current relationships in resistor, inductor and capacitor. Obtain these relationships in "s" domain also. State assumptions if any in obtaining the relationship.	Dec-10 Jan-13	**07**
7.	**Explain The Laplace Transformation method. Find Laplace Transform of Unit Step, and exponential function.**	**May-12**	**07**
8.	What is the Laplace transform of a unit step signal?	Jan-16	01
9.	**Derive Laplace transform of derivatives and integrals.** **Derive Laplace transform of derivatives and integrals.**	**Dec-11** **Jan-15**	**05** **07**

10.	**Write the circuit equations for a series RL circuit connected to a DC supply. Using Laplace transform, obtain the transfer function between Inductor current and supply voltage.** **Explain and derive the step response to R-L series circuit using Laplac Transformation method.**	**Jan-17** **May-18**	**03** **04**
11.	Write the circuit equations for a series RC circuit connected to a DC supply. Using Laplace transform, obtain the transfer function between capacitor voltage and supply voltage.	Jan-16	04
12.	How do one classify that the given circuit is of first order or second order? Obtain second order circuit models for series RLC and parallel RLC circuits in time domain and in "s" domain.	Dec-10	07
13.	With suitable example explain how the Laplace transform is useful in obtaining the transient response of a second order system.	Jan-16	07
14.	State properties of Laplace Transform and prove any one of them. What do you mean by transfer function of a system?	Jan-16 Jan-17	07 01
15.	What is the Laplace transform of a sine wave?	Jan-17	01
16.	Determine the Laplace transform of (t) = $e^{-at}\cos \omega t$.	June-16 May-17 June-19	03 03
17.	Find Laplace transform of $e^{-at}\sin\omega t$.	June-16	07
18.	Determine the Laplace transform of f(t) = tu(t).	May-18	03
19.	Explain and derive the step response to R-L series circuit using Laplace Transformation method.	June-19	07 04
20.	Explain in brief: unit ramp and unit Impulse functions. Also explain convolution integral of function. Find Laplace inverse by using convolution integral of $F(s)= \frac{1}{(s+1)(s+3)}$	June-15	07
21.	**Briefly describe the application of Laplace transform for transfer function approach in circuit analysis.**	**Jan-17**	**07**
22.	**Explain concept of Laplace transformation. What are the advantages anddisadvantages of Laplace transformation?**	**Feb-22**	**07**
23.	**Why the current in inductor and voltage in capacitor cannot changesimultaneously?**	**Feb-22**	**04**
24.	**Explain and derive the step response to R-L series circuit using LaplaceTransformation method**	**Feb-22**	**04**
25.	**Enlighten significance of poles and zeros in network functions.**	**Feb-22** **Jan-21**	**07**
26.	**What are the properties of Laplace transformation? Explain in detail.**	**Feb-22**	**03**
27.	**Obtain current equation i(t) for t ≥ 0 using Laplace Method for *Fig.8.***	**Feb -22**	**04**
28.	As shown in **Fig.DD,** the switch K is opened at time t = 0. Obtain theparticular solution for voltage v(t) across the parallel circuit using Laplace transformation.	**Feb -22**	**07**
29.	The switch is open at t = 0 for the circuit shown in **Fig.EE**. Steady statecondition has been achieved before switching. Find the expression forthe current i(t) using Laplace transformation.	**Feb -22**	**07**

30.	Obtain Laplace transformation of the following time-domain function:(i) f(t) = A (ii) f(t) = e^{-at}	**Jan-21**	**07**
31.	Convert the capacitance C (passive element) to Laplace domain using Laplace transformation.	**Jan-21**	**07**
32.	**What is meant by poles and zeros of a network function? State its important features & What are the significance of poles and zeros in network functions? Discuss the restrictions on locations of poles and zeros of transfer functions.** **Explain significance of poles and zeros in network functions. Summarize significance of pole-zero location in S-plane** **Explain the poles and zeros of a network function? State its important features & explain its physical significance .** **Explain poles and zeros of network function. Provide features of them.Define: Poles and Zeros of network transfer function.** **What do you mean by pole of a system?** **Define: Poles and Zeros of network transfer function.**	**Dec-09** **March-10** **May-12** **June-13** **Dec-13** **June-14** **Jan-15** **June-15** **Jan-15** **June-16** **Jan-16** **Nov-17** **June-16** **Jan-16** **May-17**	**07** **04** **07** **07** **01** **01**
33.	Give the importance of poles and zeros	**July 23**	**03**
34.	Elaborate the zero radian frequency and zero Neper frequency	**July 23**	**04**
35.	In the network shown in figureFF, K is closed at t = 0 with zero current in the inductor. Find the values i,di/dt ,at t=0+,for R=8Ω and L=	**July 23**	**04**
36.	In the network shown in figure.GG, a steady state is reached with switch k open. At t=0 switch k closed find out the i(t) for the given numerical values and sketch the current transient.	**July 23**	**07**

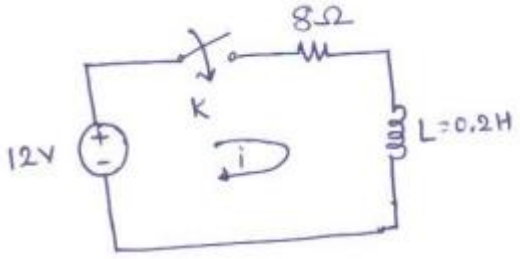


Figure FF

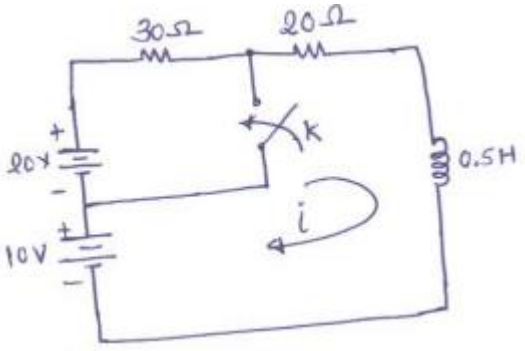


Figure GG

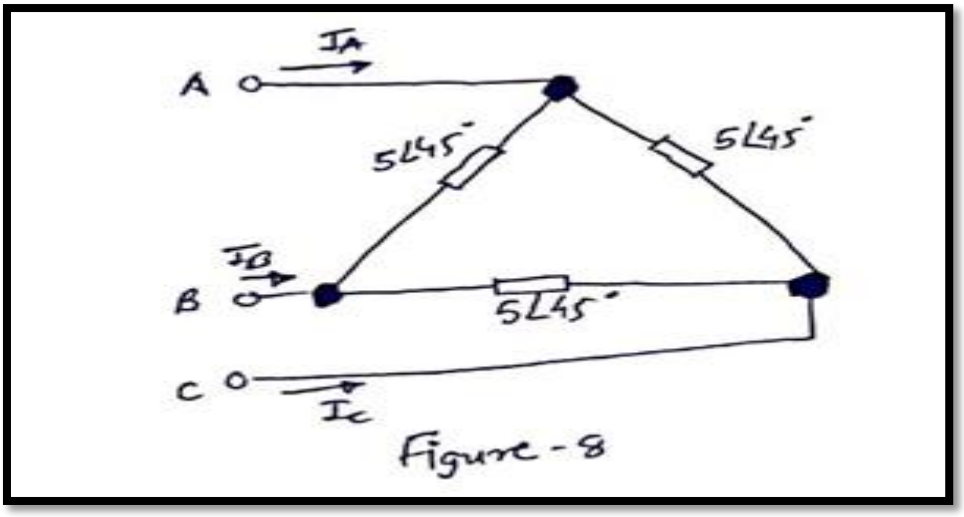


Fig DD

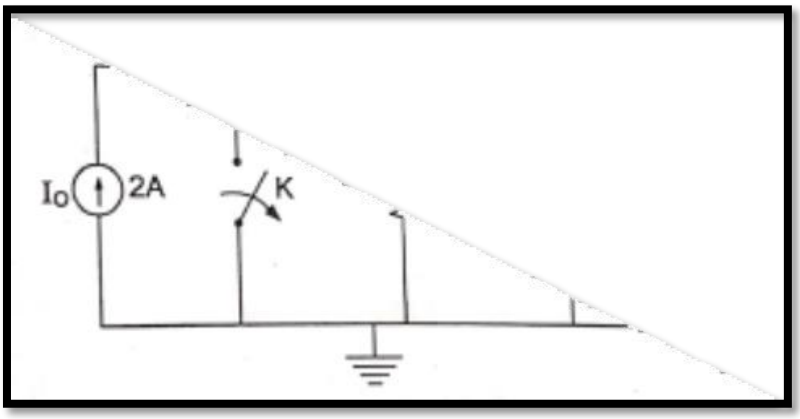
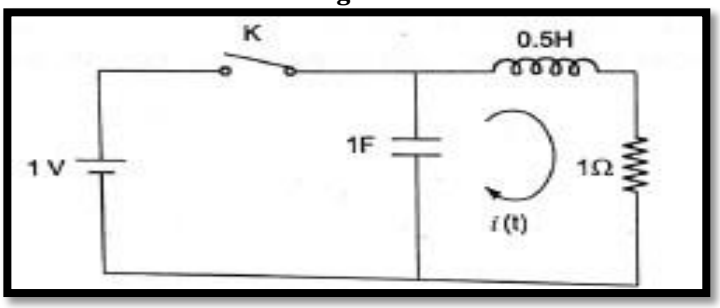


Fig-EE



Chapter-5	**Two Port Network and Network Functions** Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks. **Book : Circuits and networks, U.A.Patel, Mahajan Publication**

ATTEMPT ALL BOLD QUESTIONS.

SR. NO.	QUESTIONS	YEAR	MARKS
1.	What is two-port network?	May-17	01
1.	Define: Driving point impedance.	June-16 May-17	**01**
2.	Explain necessary conditions for driving-point functions.	Jan-16	**07**
3.	State and explain various Two port parameters and Network functions in brief.	June-15	**07**
4.	Explain the short-circuit admittance and the open-circuit impedance parameters for a two port network. Write the short-circuit admittance and the open-circuit impedance parameters for a two port network.	May-11 May-18	**07** **03**
5.	**What are Z-parameters and Y-parameters? Derive the expression for Z parameters in terms of Y parameters and vice versa.** **Derive relationship between Z-parameters and Y-parameters. Discuss Reciprocity and symmetry of network in brief.**	**Dec-09** **June-13** **June-14**	**06** **07**
6.	Derive Y-parameters in terms of Z-parameters. Determine y-parameters in terms of z-parameters. Derive y- parameters in terms of z-parameters.	Jan-16 June-16 **Nov-18** **June-19**	07 03 **03** **04**
7.	**Enlist conditions for reciprocal and symmetrical network in all types of parameters.** **What is the condition for symmetrical network for z-parameters?** **What is the condition for reciprocal network for h-parameters?** **Derive the condition for the network to be reciprocal for ABCD-parameters.**	**Jan-16** **June-16** **June-16** **June-16**	**07** **01** **01** **03**
8.	Find the expression for Z parameter in terms of ABCD parameters.	June-16	**07**
9.	Define Y parameters. Also derive ABCD parameters from Y parameters.	NOV-17	07
10.	Derive the expression of relationship between 'Y' parameters and 'h' parameters. Discuss reciprocity and symmetry of network in brief.	Dec-09 Nov-17 **June-19**	**07** **04**

	Give relationship between 'Y' parameters and 'h' parameters. Give relationship between y parameters and h parameters.		
11.	**Derive formulae to convert given 'Y' parameters into 'h' parameters.**	**Dec-13** **Jan-15** **May-18**	**07** **04**
12.	What is the condition for reciprocal network for h-parameters?	May-17	01
13.	**Explain about hybrid parameters for two port network and state where does one make use of these parameters.** **Derive expression of *h* parameter in terms of *Z* and *Y* parameters.** **Write the equation for hybrid parameters of a two-port network.**	**Dec-10** **June-15** **Jan-16**	**07** **07** **01**
14.	**Show the relationship between hybrid parameters and g-parameters of a two port network.**	**Jan-16** **Jan-17**	**07**
15.	Determine h-parameters in terms of z-parameters.	May-17	03
16.	Draw and explain equivalent circuit of two port network using h parameters.	March-10	07
17.	Derive the condition for the network to be reciprocal for ABCD-parameters.	May-17	03
18.	Briefly describe ABCD parameters and inverse ABCD parameters for a symmetric two port network.	Jan-17	**03**
19.	ABCD parameters are also known as transmission parameters and they are derived from the basic two port network parameters. Show that, for reciprocal linear time invariant two port network, AD-BC =1.	Dec-10	**07**
20.	**Derive expression of ABCD parameters in terms of Z and Y parameters.**	**Jan-15**	**07**
21.	Explain the various Two port parameters in brief. Hence derive the expression of ABCD parameters in terms of Z parameters.	May-12 May-18	**07**
22.	**Explain the various types of Interconnections of the Two port networks in brief.** **Discuss various interconnection of two-port networks.**	**May-12** **June-15** **Jan-16**	**07** **07**
23.	Derive the condition of reciprocity and symmetry in Z-parameter	**Nov-18**	**07**
24.	Derive equation of ABCD parameters in terms of h-parameter	**Nov-18**	**07**
25.	Derive z- parameters in terms of y-parameters.	**Nov-18**	**03**
26.	Derive the condition for the network to be reciprocal for ABCD-parameters.	**June-19**	**04**
27.	What is the condition of symmetry of all different two port parameters?	**Sept-21**	**03**
28.	Derive expression of Y parameters in terms of Z parameters.	**Sept-21**	**04**
29.	Obtain the Y parameters of the given network in **Figure 12**	**Sept-21**	**07**
30.	Explain the transmission line parameters for the two-port network.	**Sept-21**	**03**
31.	Obtain Y-parameters for the given network shown in **Figure 13**	**Sept-21**	**04**

32.	Obtain the Z parameters of the given network in **Figure 14**	**Sept-21**	**07**
33.	Derive condition of Symmetry of h-Parameter.	**Feb-22**	**03**
34.	Derive relationship of z-Parameter in terms of ABCD Parameter	**Feb-22** **July-23**	**04**
35.	Obtain h-Parameters of the network shown in **Fig. 9**	**Feb-22**	**07**
36.	Derive condition of reciprocity of y-Parameters.	**Feb-22**	**03**
37.	Derive relationship of h-Parameter in terms of g-Parameters	**Feb-22**	**04**
38.	Obtain Transmission Parameters of the network shown in **Fig. 10.** Find whether the network is (i) symmetrical (ii) reciprocal	**Feb-22**	**07**
39.	Enlighten the interpretation of "j" operator	**July-23**	**03**
40.	Derive the condition for reciprocity for z-parameters.	**July - 23**	**03**
41.	For the network shown in figure.YY calculate the y parameters	**July - 23**	**07**
42.	For the network shown in figure ZZ calculate the h- parameters.	**July - 23**	**07**

NOTE:

SUGGESTION ABOUT ANY MISPLACEMENT IN QUESTION WITH RESPECT TO ITS CHAPTER IS WELCOMED.

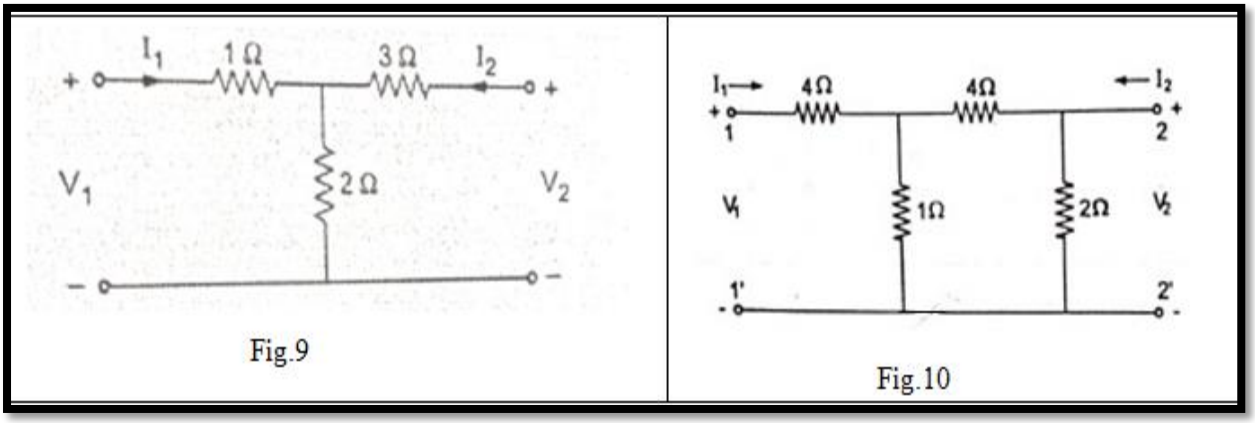


Fig.9 Fig.10

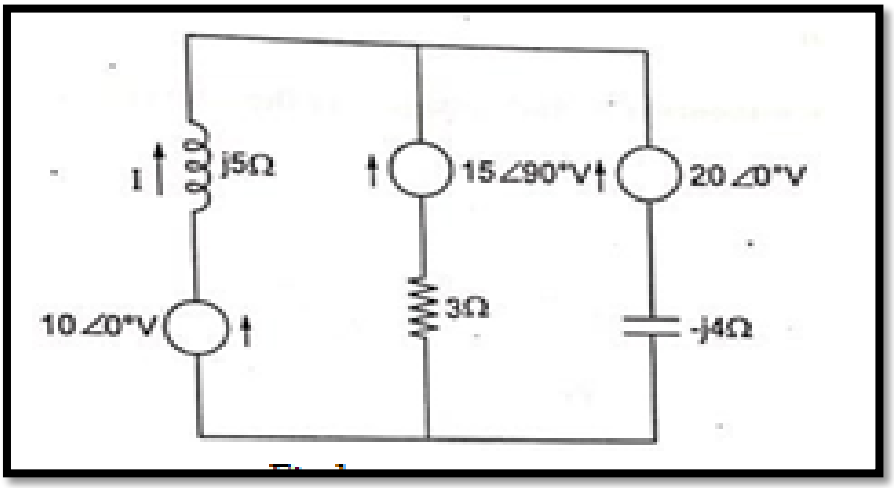
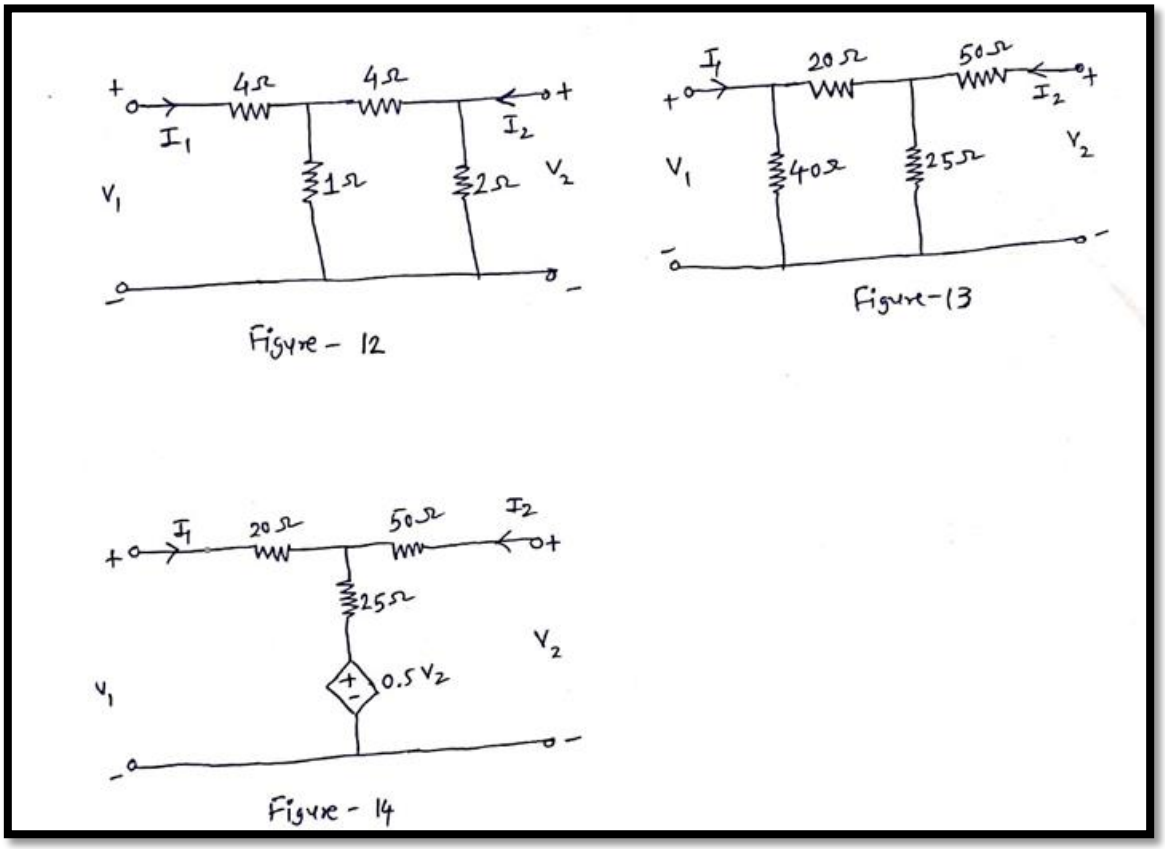
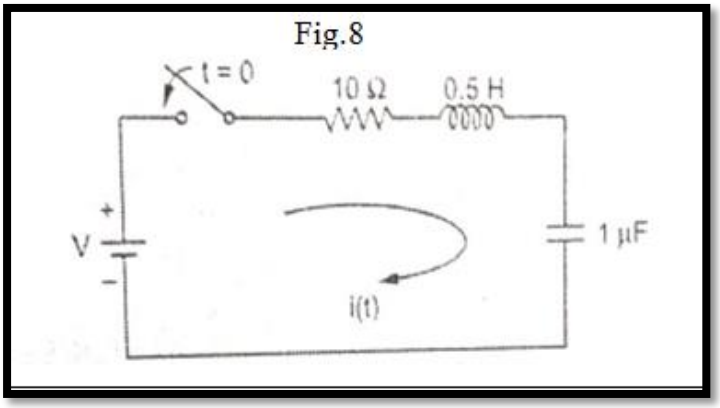

j5Ω
15∠90°V
20∠0°V
10∠0°V
3Ω
-j4Ω

Fig-A


4Ω
4Ω
1Ω
2Ω
Figure – 12
20Ω
50Ω
40Ω
25Ω
Figure-13
20Ω
50Ω
25Ω
0.5 V2
Figure - 14



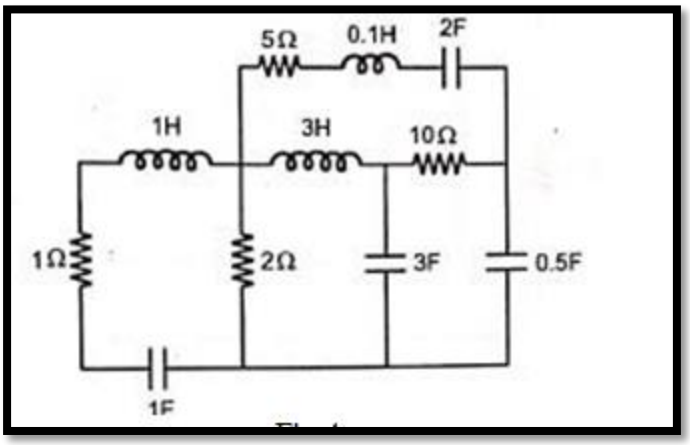


Fig XX

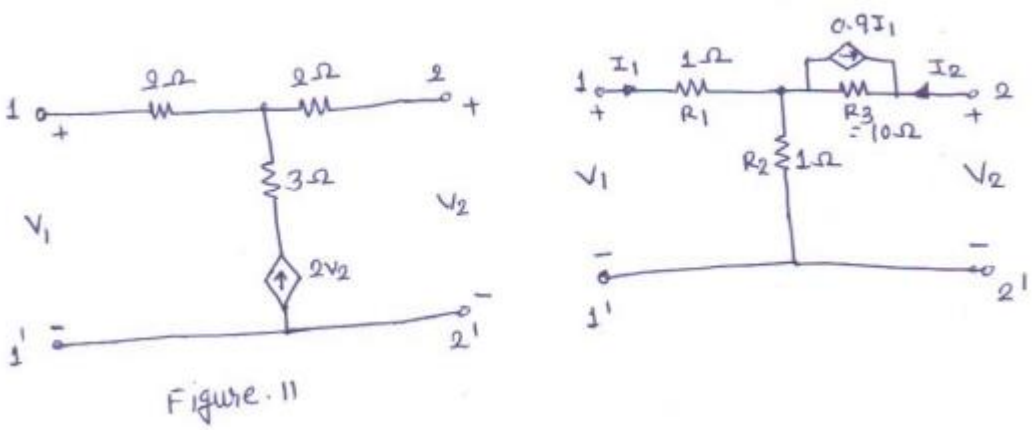


Fig YY **FIX ZZS**