

NETWORK THEORY

OBJECTIVES AND RELEVANCE

This course introduces the basic concepts of network theory which is the foundation for all subjects of the electrical engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes three phase circuits, transient analysis, two port networks and filters.

SCOPE

The scope of this subject is to provide an insight into the working and applications of electrical machines, transmission lines and modeling of various other systems. Also, it provides clear and concise exposure to the principles and applications of electrical circuits to solve complex networks in the field of electrical engineering.

PREREQUISITES

This subject recommends continuous practice of various networks. It needs requisite knowledge about mathematical fundamentals and applications of advanced mathematics like Fourier transform, Laplace transforms, differential equations and vectors, complex analysis. Also circuit elements and basic electrical laws.

JNTU SYLLABUS

UNIT-I

OBJECTIVE

This unit explains a comprehensive study of three-phase circuits and power measurement in both balanced and unbalanced circuits.

SYLLABUS

Three phase circuits: Phase sequence, star and delta connection, relation between line and phase voltages and currents in balanced systems, analysis of balanced and unbalanced 3 phase circuits, measurement of active and reactive power.

UNIT-II

OBJECTIVE

This unit explains the transient behavior of DC circuits and their response. It describes the transient response of series-parallel circuits for DC excitation by using differential equations and Laplace transforms.

This unit describes the transient response of series-parallel circuits for sinusoidal excitation by using differential equations and Laplace transforms.

SYLLABUS

Transient response of R-L, R-C, R-L-C circuits (series and parallel combinations) for sinusoidal excitation, initial conditions, classical method and Laplace transforms methods of solutions.

Transient response of R-L, R-C, R-L-C circuits (series and parallel combinations) for d.c. excitation initial conditions, classical method and Laplace transforms methods of solutions

UNIT-III

OBJECTIVE

This unit describes concept of complex frequency, transform impedance and transform circuits, network functions, driving point and transfer functions, significance poles and zeros and necessity of transfer functions.

SYLLABUS

The concept of Complex Frequency, Physical Interpretation of Complex Frequency, Transform Impedance and Transform Circuits, Series and parallel Combination of Elements, Terminal Pairs or Ports, Networks Functions for the One-port and Two-port, Poles and Zeros of Network Functions, Significance of Poles and Zeros, Properties of Driving Point Functions, Properties of Transfer Functions, Necessary Conditions for Driving Point Functions, Necessary Conditions for Transfer Functions, Time Domain Response from pole Zero Plot.

UNIT-IV
OBJECTIVE

This unit describes the parameters of two port networks and their interrelations and cascaded networks and concept of transformed networks.

SYLLABUS

Cascaded network, Concept of transformed network, 2-port network parameters using transformed variables.

Two port network parameters: z, y, ABCD and hybrid parameters and their relations

UNIT-V
OBJECTIVE

This unit describes analysis and design of various types of filters with different configurations.

This unit deals with Fourier series of waveform analysis and analysis of electrical circuits to non-sinusoidal periodic waveforms. It also deals with Fourier integrals and Fourier transforms and their applications.

SYLLABUS

The Fourier theorem, consideration of symmetry, exponential form of Fourier series, line spectra and phase angle spectra, Fourier integrals and Fourier transforms, properties of Fourier transforms.

Low pass, High pass, Band pass, Band elimination, Prototype filter design.

GATE SYLLABUS

UNIT-I

3 phase circuits.

UNIT-II

Transient response of DC networks and Transient response of AC networks

UNIT-III

Not Covered

UNIT-IV

Driving point impedance and transfer functions of two port network.

UNIT-V

Filters

IES SYLLABUS

UNIT-I

3 phase circuits

UNIT-II

Transient response and steady state response for arbitrary inputs

UNIT-III

Properties of networks in terms of poles and zeros. Transfer function.

UNIT-IV

Two-port networks, Elements of two-element network synthesis.

SUGGESTED BOOKS

TEXT BOOKS

- T1 Electric Circuits by A. Chakrabarthy, Dhanipat Rai & Sons.
- T2 Network analysis, N.C. Jagan and C. Lakhminarayana, BS publication.

REFERENCE BOOKS

- R1 Engineering circuit analysis, William Hayt, Jack E. Kemmerly, S M Durbin, McGraw Hill Companies.
- R2 Electric Circuits by David A. Bell, Oxford University Press.
- R3 Electric Circuit Analysis, K.S Suresh Kumar, Pearson Education.
- R4 Circuits, A. Bruce Carlson, Cengage Learning
- R5 Network Analysis and Carlson, Cengage Learning.
- R6 Electrical Circuits an introduction, KCA Smith & RE Alley, Cambridge University Press.
- R7 Circuits & Networks by A. Sudhakar and Shyammoan S Palli, Tata McGraw Hill.
- R8 Electric Circuit Analysis by B. Subrahmanyam, I.K. International.
- R9 Network Analysis by M.E. Van Valenberg
- R10 Electric Circuit Analysis by C.L. Wadhwa, New Age International.

WEBSITES

Do not confine yourself to the list of websites mentioned here alone. Be cognizant and keep yourself abreast of the others too. The given list is not exhaustive.

- 1. www.mit.edu
- 2. www.soe.stanford.edu
- 3. www.grad.gatech.edu
- 4. www.gsas.harvard.edu
- 5. www.eng.ufl.edu
- 6. www.iitk.ac.in
- 7. www.iitd.ernet.in
- 8. www.iitb.ac.in
- 9. www.iitm.ac.in
- 10. www.iitr.ac.in
- 11. www.iitg.ernet.in
- 12. www.bits-pilani.ac.in
- 13. www.bitmesra.ac.in
- 14. www.psgtech.edu
- 15. www.iisc.ernet.in
- 16. www.circuit-magic.com
- 17. www.ieee.org

EXPERTS' DETAILS

The Expert Details which have been mentioned below are only a few of the eminent ones known Internationally, Nationally and Locally. There are a few others known as well.

INTERNATIONAL

- 1. Mr. Clayton R. Paul,
B.S., M.S., Ph.D.,
Professor of Electrical and Computer Engineering,
Dept. of Electrical and Computer Engg.
School of Engineering, Mercer University, Macon, Georgia - 31207, Ph.:(912) 301-2213
www.faculty.mercer.edu/paul_cr
- 2. Mr. Joseph A. Edminister,
Emeritus of Electrical Engineerings,

Uni. of Akron, Akron, Ohio

NATIONAL

1. Dr. D.GaneshRao
Prof. & Head,
Deptt. of Telecommunication Engg.,
M.S. RamayyaInstt. of Tech., Bangalore
2. Prof. S.C. Dutta Roy,
Deptt. of Electrical Engg.,
IIT, Delhi.
3. Mr. A.NagoorKani,
52, Seshachalam Street,
Saidapet, Chennai.

REGIONAL

1. Prof. N.S. Murthy,
Dept. of ECE,
NIT, Warangal.
2. Mr. K.V.SrinivasaRao,
Professor, ECE, Aurora's Engineering College,
Bhongir, Nalgonda.

JOURNALS

INTERNATIONAL

1. IEEE transactions on circuits and systems
2. IEEE proceedings circuits, devices and systems
3. International journal of circuit theory and applications (Ireland)
4. IEEE transactions on electron devices
5. Circuits, systems and signal processing (USA)

NATIONAL

1. Electrical India
2. Power engineering

7.6.9 FINDINGS AND DEVELOPMENTS

INTERNATIONAL

1. M.J Gander and A.E Ruehli, "Optimized waveform relaxation methods for RC type circuits" IEEE Transactions on Circuits and systems-I; vol.51,No.4 pp 755-768 April 2004.
Waveform Relaxation has been widely used in circuit theory for the solution of large systems of ordinary and partial differential equations. This paper proposes a near optimized WR algorithm which greatly accelerates the convergence. Based on this WR technique many circuit solvers were built.
2. Sigmond Singer, ShaulOzeri, DoronShmilovitz, "A pure realization of loss free resistor" IEEE Transactions on Circuits and systems vol 51 no.8, pp 1639-1647, Aug 2004.
Practically the input characteristic is not pure resistive due to the ripple and filtering effects. A method which enables reduction of the ripple to negligible values and the eliminations of the input filter is presented, which facilitates realization of practical circuits with nearly pure input resistive characteristic.
3. J.Paul, A. Vander Wagt, and C.L.Conrad, "A layout structure for matching many integrated resistors," IEEE Transactions on Circuits and systems-I, vol 51,No 1 pp186-190, jan 2004.
It proves that a mirrored shuffle layout pattern for an array of many resistors can cancel systematic gradient errors in resistor value up to second order.

4. F. Filippetti and M. Artioli, "Ime : 4-Term formula method for the symbolic analysis of linear circuits," IEEE Transactions on Circuits and systems-I, vol 51, No.3, pp526-538, march 2004.
Symbolic analysis is defined as a technique to generate closed form analytic expressions with some or all parameters left lateral. This paper is intended to show a general method called Inhibition method (IME) which follows a hierarchical structuration that is halfway logical and halfway physical.
5. W.S.Lu, " A unified approach for the design of 2-D digital filters via semidefinite programming," IEEE Transactions on Circuits and systems-I vol 49, no.6, pp814-826, june 2002.
This paper attempts to demonstrate that a modern optimization methodology know as semidefinite programming can be served as the algorithmic care of a unified design tool for a variety of two dimensional digital filters.

NATIONAL

1. Jared Jones "Trusting integrated circuits in metering applications", Electrical India sep 2003 vol. 43 no.12 pp 46-48.
Electricity meter manufacturers are revolutionizing the industry by designing electronic meters in place of electromechanical meters. Many manufacturers (AD) are trusting ICs to prevent failures.
2. Tribhuvankabra, " Fire safe electrical wires" Electrical India Oct 2003 vol. 43 no.13 pp 36-38.
Electrical cables are the lifetime of electricity. The Indian electrical wire and cable industry is growing by nearly 30% every year, and recently there were some new brilliant ideas brought in by them.
3. International copper promotional council(IPC) – " Ensure electrical safety by proper house wiring", Electrical India Oct 2004 vol. 44 no.10 pp 56-59.
Unsafe house wiring could eventually lead to electrical failure, causing fire and destroying life and costly equipments. This article presents some safety methods of housewiring.
4. Thoughts of Dr.A.P.J.Abdulkalam, " Providing quality power to the nation", Electrical India Dec 2004 vol. 44 no.12 pp 38-43. It's the focus article of the annual addition which gives the thoughts of Dr. A. P. J. Abdul Kalam on power quality.

SESSION PLAN

Sl. No.	Topics in JNTU Syllabus	Modules and Sub-modules	Lecture	Suggested Books	Remarks
UNIT-I (Three Phase Circuits)					
1	Three phase circuits, Phase sequence	Introduction Objective and Relevance Advantages of 3-phase system Generation of 3-phase voltages	L1	T1-Ch6, T2-Ch4 R1-Ch12, R4-Ch7 R7-Ch9, R8-Ch8	GATE IES
2	Star and delta connection	Star connection, example Delta connection, example Inter connection of loads Star to delta and delta to star transformation	L2	T1-Ch6, T2-Ch4 R1-Ch12, R4-Ch7 R7-Ch9, R8-Ch8	GATE IES
		Problems	L3	T1-Ch6, T2-Ch4 R1-Ch12, R4-Ch7 R7-Ch9, R8-Ch8	GATE IES
3	Relation between line and phase voltages and currents in balanced systems	Voltage relations and current relations in star connected system, Power in the star connected network Problems	L4	T1-Ch6, T2-Ch4 R1-Ch12, R4-Ch7 R7-Ch9, R8-Ch8	GATE IES
		Voltage relations and current relations in delta connected system, Power in the delta connected network Problems	L5	T1-Ch6, T2-Ch4 R1-Ch12, R4-Ch7 R7-Ch9, R8-Ch8	GATE IES

Sl. No.	Topics in JNTU Syllabus	Modules and Sub-modules	Lecture	Suggested Books	Remarks
4	Analysis of balanced and unbalanced 3 phase circuits	Balanced 3-phase system-star connected load Balanced 3-phase system-delta connected load, Problems	L6	T1-Ch6,T2-Ch4 R1-Ch12,R4-Ch7 R7-Ch9,R8-Ch8	GATE IES
		Unbalanced delta connected load Problems	L7	T1-Ch6,T2-Ch4 R1-Ch12,R4-Ch7 R7-Ch9,R8-Ch8	GATE IES
		Types of unbalanced loads Unbalanced four wire and three wire star connected load Star –delta method Problems	L8	T1-Ch6,T2-Ch4 R1-Ch12,R4-Ch7 R7-Ch9,R8-Ch8	GATE IES
5	Measurement of active and reactive power	Three wattmeter and two wattmeter methods for measurement of power and power factor	L9	T1-Ch6,T2-Ch4 R1-Ch12,R4-Ch7 R7-Ch9,R8-Ch8	GATE IES
		Measurement of reactive power Numerical problems	L10	T1-Ch6,T2-Ch4 R1-Ch12,R4-Ch7 R7-Ch9,R8-Ch8	GATE IES
		Numerical problems	L11	T1-Ch6,T2-Ch4 R1-Ch12,R4-Ch7 R7-Ch9,R8-Ch8	
UNIT-II (D.C. & AC Transient Analysis)					
6	Transient response of RL, RC, RLC circuits (series and parallel combinations) for DC excitations. Solution method using differential equations	Introduction Transient response of RL series circuit for DC excitation Examples	L12	T1-Ch8,T2-Ch7&8 R1-Ch8,R4-Ch9 R7-Ch11,R8-Ch4	GATE IES
		Transient response of RC series circuit for DC excitation Problems	L13	T1-Ch8,T2-Ch8 R1-Ch8,R4-Ch9 R7-Ch11,R8-Ch4	GATE IES
		Transient response of RLC series circuit for DC excitation,Problems	L14	T1-Ch8,T2-Ch8 R1-Ch9,R4-Ch9 R7-Ch11,R8-Ch4	GATE IES
		Additional problems	L15	T1-Ch8,T2-Ch8 R1-Ch9,R4-Ch9 R7-Ch11,R8-Ch4	GATE IES
		Introduction Transient response of parallel RL circuit's with DC excitation Problems	L16	T1-Ch8,T2-Ch8 R1-Ch8,R4-Ch9 R7-Ch11,R8-Ch4	GATE IES

Sl. No.	Topics in JNTU Syllabus	Modules and Sub-modules	Lecture	Suggested Books	Remarks
		Introduction Transient response of parallel RC circuit's with DC excitation Problems	L17	T1-Ch8,T2-Ch8 R1-Ch8,R4-Ch9 R7-Ch11,R8-Ch4	GATE IES
		response of parallel RLC circuit's Transient with DC excitation Problems	L18	T1-Ch8,T2-Ch8 R1-Ch9,R4-Ch9 R7-Ch11,R8-Ch4	GATE IES
7	Solution method using Laplace transform methods	Applications of Laplace transform for RL circuits	L19	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Applications of Laplace transform RC circuits	L20	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Applications of Laplace transform RLC circuits	L21	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Problems on series circuits using Laplace transform	L22	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
8	Transient response of RL, RC, RLC circuits (series and parallel combinations) for sinusoidal excitation. Solution method using differential equations	Transient response of RL series circuit for sinusoidal excitation Problems	L23	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Transient response of RC series circuit for sinusoidal excitation Problems	L24	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Introduction Transient response of RLC series circuit for sinusoidal excitation Problems	L25	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Additional problems	L26	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Introduction Transient response of parallel RL circuit's with sinusoidal excitation Problems	L27	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Transient response of parallel RC circuit's with sinusoidal excitation Problems	L28	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Transient response of parallel RLC circuits with sinusoidal excitation Problems	L29	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
9	Solution method using Laplace transform methods	Applications of Laplace transform for RL circuits	L30	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Applications of Laplace transform RC circuits	L31	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Applications of Laplace transform RLC circuits	L32	T1-Ch8,T2-Ch8 R7-Ch11 R8-Ch4	GATE IES
		Problems on series circuits using Laplace transform	L33	T1-Ch8,T2-Ch8 R7-Ch11,R8-Ch4	GATE IES

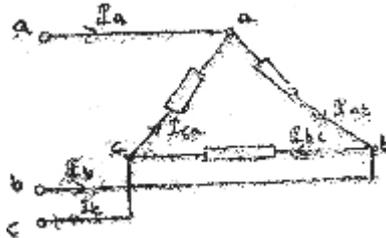
Sl. No.	Topics in JNTU Syllabus	Modules and Sub-modules	Lecture	Suggested Books	Remarks
UNIT-III (Network Functions)					
10	The concept of complex frequency, Physical interpretation of complex frequency	Physical significance of complex frequency and a number of special cases for values of S_n	L34	T1-Ch14,R4-Ch10 R7-Ch15,R8-Ch11 R9-Ch9,R10-h9	GATE IES
11	Transform impedance and transform circuits	Transform Impedance and Transform admittance representation for R,L and C elements	L35	T1-Ch14,R4-Ch10 R7-Ch15,R8-Ch11 R9-Ch9,R10-Ch9	GATE IES
12	Series and parallel combination of elements, terminal pairs or ports	Representation of network in series and parallel combinations,problems	L36	T1-Ch14,R4-Ch10 R7-Ch15,R8-Ch11 R10-Ch9, R9-Ch9&10	GATE IES
13	Networks functions for the one-port and two-port	Voltage transfer ratio Current transfer ratio Transfer impedance and admittance Problems	L37	T1-Ch14,R4-Ch10 R7-Ch15,R8-Ch11 R9-Ch10,R10-Ch9	GATE IES
14	Poles and zeros of network functions, Significance of poles and zeros	Driving point impedance and admittance Voltage transform ratio Other network functions	L38	T1-Ch14,R4-Ch10 R7-Ch15,R8-Ch11 R9-Ch10,R10-Ch9	GATE IES
15	Properties of driving point functions, Properties of transfer functions	Definition Poles and zeros T and π equivalent networks	L39	T1-Ch14,R4-Ch10 R7-Ch15,R8-Ch11 R9-Ch10,R10-Ch9	GATE IES
16	Necessary conditions for driving point functions, Necessary conditions for transfer functions	The restrictions on pole and zero location in driving point and transfer functions	L40	T1-Ch14,R4-Ch10 R7-Ch15,R8-Ch11 R9-Ch10,R10-Ch9	GATE IES
17	Time domain response from pole zero plot	Current response for a given voltage Problems	L41	T1-Ch14,R4-Ch10 R7-Ch15,R8-Ch11 R9-Ch10,R10-Ch9	GATE IES
UNIT-IV (Network Parameters)					
18	Two port network parameters – z, y, ABCD and hybrid parameters and their relations	Two port network Explanation to z - parameters Problems	L42	T1-Ch12,T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
		Explanation to y - parameters Problems	L43	T1-Ch12,T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
		Explanation to T – parameters (A, B, C, D parameters) Cascade connection Problems	L44	T1-Ch12,T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
		Explanation to h - parameters Problems	L45	T1-Ch12,T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
		Expression of z-parameters interms of y-parameters and vice-versa ABCD parameters interms of z-parameters and y-parameters	L46	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
		Reciprocity and symmetricity conditions Problems	L47	T1-Ch12, T2-Ch9 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
		Problems	L48	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES

Sl. No.	Topics in JNTU Syllabus	Modules and Sub-modules	Lecture	Suggested Books	Remarks
19	Cascaded networks	Series and parallel combination of two port network, Problems	L49	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
		Expression for network parameters connected in cascade	L50	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10	GATE IES
		Expression for network parameters connected in cascade	L51	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10	GATE IES
20	Concept of transformed network, Two port network parameters using transformed variables	Resistance ,Inductance and Capacitance Voltage and current transfer ratios Transfer impedance and admittance	L52	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10	GATE IES
		Numerical problems on two port networks	L53	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10	GATE IES
		Numerical problems on two port networks	L54	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
		Numerical problems on two port networks	L55	T1-Ch12, T2-Ch9 R1-Ch17,R4-Ch14 R7-Ch16,R8-Ch10 R9-Ch11	GATE IES
UNIT-V (Filters and Fourier analysis of AC Circuits)					
21	Low pass, High pass, Band pass, Band elimination, Prototype filter design	Introduction to filters Properties Classification Equation of filter networks	L56	T1-Ch18,T2-Ch10 R7-Ch17,R10-Ch10	GATE IES
		Concept of working of low pass and high pass filters using reactive elements Analysis of prototype filter section	L57	T1-Ch18, T2-Ch10 R7-Ch17,R10-Ch10	GATE IES
		Analysis and design of prototype low pass filter (constant-k)	L58	T1-Ch18, T2-Ch10 R7-Ch17,R10-Ch10	GATE IES
		Analysis and design of prototype high pass filter (constant-k)	L59	T1-Ch18, T2-Ch10 R7-Ch17,R10-Ch10	GATE IES
		Problems on low pass and high pass filters	L60	T1-Ch18, T2-Ch10 R7-Ch17,R10-Ch10	GATE IES
		m-derived low pass and High pass filter problems	L61	T1-Ch18, T2-Ch10 R7-Ch17,R10-Ch10	
		Analysis and design of prototype band pass filter (constant-k)	L62	T1-Ch18, T2-Ch10 R7-Ch17,R10-Ch10	GATE IES
		Analysis and design of prototype band stop filter (constant-k)	L63	T1-Ch18, T2-Ch10 R7-Ch17,R10-Ch10	GATE IES
		Problems on band pass and band stop filters	L64	T1-Ch18, T2-Ch10 R7-Ch17,R10-Ch10	GATE IES
22	The Fourier theorem, Consideration of symmetry	Introduction to Fourier theorem Symmetry in Fourier series Even, odd and half wave symmetry Problems	L65	T1-Ch16, R1-Ch18 R7-Ch12,R8-Ch7 R9-Ch15	GATE IES
23	Exponential form of Fourier series	Representation of periodic function Problems	L66	T1-Ch16, R1-Ch18 R7-Ch12, R8-Ch7 R9-Ch15	GATE IES
24	Line spectra and phase anglespectra, Fourier integrals and fourier transforms	Problems on fourier transforms for various inputs	L67	T1-Ch16, R1-Ch18 R7-Ch12, R8-Ch7 R9-Ch16	GATE IES
		Fourier transform of periodic signals and problems	L68	T1-Ch16, R1-Ch18 R7-Ch12, R8-Ch7	GATE IES

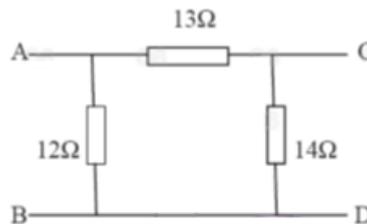
Sl. No.	Topics in JNTU Syllabus	Modules and Sub-modules	Lecture	Suggested Books	Remarks
				R9-Ch16	
25	Properties of fourier transforms	Linearity, Scaling, Symmetry, Convolution, Frequency differentiation and Integration, Time shifting and frequency shifting	L69	T1-Ch16, R1-Ch18 R7-Ch12, R8-Ch7 R9-Ch16	GATE IES
		Problems	L70	T1-Ch16, R1-Ch18 R7-Ch12, R8-Ch7 R9-Ch16	GATE IES

UNIT-I

- Derive the relation between line and phase currents and Voltages in star connection of a 3- Phase (balanced and unbalanced) system.
 - A delta connected load is shown in Figure1. When each phase has an impedance of $(10+j15) \Omega$ what is the line current if the applied line voltage is 230V? Obtain the amount of power consumed per phase. What is the phasor sum of the three line currents? [Jun-2014]



- Give Star – Delta and Delta – Star transformation equations.
 - Obtain star connected equivalent circuit for the delta connected circuit shown in the below Figure 1.



- A three phase balanced delta connected load of $(4+j8)\Omega$ is connected across a 400V, 3- \emptyset balanced supply. Determine the phase currents and line currents. Assume the phase of sequence to be RYB. Also calculate the power drawn by load. [May-2013]
- Discuss relationship between line and phase quantities in star and delta connected systems.
 - A 400 V, 3- \emptyset balanced source is connected to an unbalanced mesh connected impedances of $Z_{ab}=10\angle 45^\circ$, $Z_{bc}=20\angle 20^\circ$, $Z_{ca}=30\angle -53^\circ$. Determine the line currents and the total active & reactive power. [April-May, 2012]
 - Derive the expressions for power using two wattmeter method.
 - Discuss about the readings of wattmeters in two wattmeter method due to effect of power factor. [April-May, 2012]
 - Draw the phasor diagram for a 3- \emptyset motor whose power is measured by two wattmeter method. [April-May, 2012]
 - Derive the expression for the instantaneous power measured in the above case.
 - Explain the methods to determine active and reactive power in a 3- \emptyset circuit.
 - A star connected load of $Z_R = 6\Omega$, $Z_Y = j5\Omega$, $Z_B = j7\Omega$ is supplied by a 400V, 3- \emptyset symmetrical supply. Determine the line currents. The phase sequence is RYB. [April-May, 2012]

[April-May, 2012]

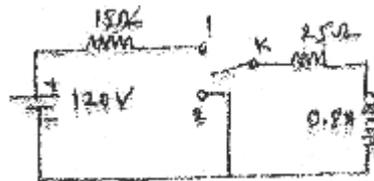
7. a) Derive the relation between line and phase voltages and currents in a balanced delta Connected system.
b) A balanced three phase load of $25+j30\Omega$ per phase is connected in delta across 440V, 3 phase Supply. Determine line currents, phase currents & Total active power. Also draw the phasor diagram. **[Dec-2011]**
8. a) What are the different methods used for measuring power in three phase circuits?
b) A balanced the phase load of $30+j40\Omega$ per phase is star connected across 400 V, 50 Hz, 3-phase supply. Determine phase currents and phase voltages. Also draw the phasor diagram. **[Dec-2011]**
9. a) With the help of circuit diagram, explain the procedure of measuring power in three phase circuits using two watt meters.
b) A balanced three load of $(15-j20)\Omega$ per phase is delta connected across 220V, 50Hz, 3-phase supply. Calculate total active and reactive power. Also draw the complete phasor diagram. **[Dec-2011]**
10. a) Derive the relationship between line and phase voltage and currents in a balanced star connected system. **[Dec-2011]**
b) Prove that the power in three phase circuit can be measured using two watt meters.
11. a) Derive the expression for the power measured and power factor in the two watt meter method applied for balanced loads.
b) A 3-phase 500 V motor operates at a power factor of 0.4 and takes an input power of 30 kW. Two watt meters are employed to measure the input power. Find readings on each instrument. **[Apr/May, 2011]**
12. a) Derive expression for the power measured in two watt meter method for un balanced loads.
b) The two watt meter readings in a 3 - phase power measurement are 800 W and 400 W. The latter reading is being obtained after the reversal of current coil. Calculate the total power and power factor of the load. **[Apr/May, 2011]**
13. a) Discuss the effect of variation of power factor on the readings of two watt meters used in 3-phase power measurement. **[Apr/May, 2011]**
b) Calculate the active and reactive components of the currents in each phase of a star connected generator supplying at 11 kV to a load of 5 MW at 0.8 pf lagging. What is the value of new output if the total current is same and the pf is raised to 0.85?
14. a) Explain the measurement of reactive power in a 3-phase circuit single wattmeter method.
b) A balanced 3-phase star connected load of 200 kW takes a leading current of 150 amps with a line voltage of 1200 V at 60 Hz. What are the circuit constants of the load per phase? **[Apr/May, 2011]**
15. i. Three identical impedances of $(3+j4)\text{ohms}$ are connected in delta. Find an equivalent star network such that the line current is the same when connected to the same supply.
ii. Three impedances of $(7+j4)\text{ohms}$, $(3+j2)\text{ohms}$ and $(9+j2)\text{ohms}$ are connected between neutral and the R, Y and B phases. The line voltage is 440V, Calculate.
a. The line currents and
b. The current in the neutral wire.
c. Find the power consumed in each phase and the total power drawn by the circuit. **(May 08)**
16. i. Explain how power is measured in three phase delta connected load using two wattmeters.
ii. A balanced mesh connected load of $(8+j6)\text{ohms}$ per phase is connected to a 3-phase, 50Hz, 230V supply. Calculate
a. line current
b. Power factor
c. Reactive volt-ampere and
d. Total volt-ampere **(May 08)**

17. A symmetrical 3-phase, 3-wire, 440V supply is connected to a star connected load. The impedances in each branch are : $Z_1=(2+j3)\text{ohms}$, $Z_2=(1-j2)\text{ohms}$, $Z_3=(3+j4)\text{ohms}$. Find its equivalent delta connected load. Hence find the phase and line currents and the total power consumed in the circuits. **(May 08)**
18. i. The power delivered to a balanced delta connected load by a 400 volt 3-phase supply is measured by two wattmeter method. If the readings of the two wattmeter are 2000 and ? 1500 watts respectively, calculate the magnitude of the impedance in each arm of the delta load and its resistive component?
 ii. A balanced delta connected load of $(2+j3)$ ohms per phase is connected to a balanced three-phase 440V supply. The phase current is 10A. Find the
 a. total active power
 b. Reactive power and
 c. apparent power in the circuit **(Feb 08)**
19. i. On a symmetrical 3-phase system, phase sequence RYB, a capacitive reactance of 8ohms is across YB and a coil $(R+jX)$ across RY. Find R and X such that $I_y = 0$.
 ii. Find the reading on the wattmeter when the network shown in figure. is connected to a symmetrical 440V, 3-phase supply. The phase sequence is RYB. **(Feb 08, Sep 06)**
20. i. What is phase sequence? Explain its significance.
 ii. A star connected three phase load has a resistance of 8 ohms and a capacitive reactance of 10 ohms in each phase. It is fed from a 400v, 3-phase balanced supply.
 a. Find the line current, total volt-amperes, active and reactive power
 b. Draw phasor diagram showing phase voltages, line voltages and currents. **(Feb 08)**
21. i. For the network shown in figure , calculate the line currents and power consumed if the phase sequence is ABC.
 ii. An unbalanced star connected load is connected across a 3- \square , 400V balanced supply of phase sequence RYB as shown in figurea. Two wattmeters are connected to measure the total power supplied as shown in fig. Find the readings of the wattmeters. **(May 07)**
22. i. Two wattmeters are used to measure power in a 3-phase three wire load. Determine the total power, power factor and reactive power, if the two watt meters read
 a. 1000w each, both positive
 b. 1000w each, but of opposite sign.
 ii. What is phase sequence? Explain its significance?
 iii. What are the advantages of a poly phase system over a single phase system. **(May 07)**
23. i. The power delivered to a balanced delta connected load by a 400 volt 3-phase supply is measured by two wattmeter method. If the readings of the two wattmeter are 2000 and 1500 watts respectively, calculate the magnitude of the impedance in each arm of the delta load and its resistive component?
 ii. A balanced delta connected load of $(2+j3)$ Ω per phase is connected to a balanced three-phase 440V supply. The phase current is 10A. Find the
 a. total active power
 b. Reactive power and
 c. apparent power in the circuit. **(May 07)**
24. i. A balanced 3-ph star connected load of 150 Kw takes a leading current of 100A with a line voltage of 1100 V, 50Hz. Find the circuit constants of the load per phase?
 ii. Three equal star connected inductors takes 8Kw at P.f of 0.8 when connected to 460V, 3- \square , 3 wire supply. Find the line currents, if one conductor is short circuited. **(Sep 06)**
25. i. Determine the line currents in an unbalanced star connect load supplied from a symmetrical 3-phase 440v system. The branch impedances The phase sequence is RYB. **(Sep 06)**
26. i. Three impedances each of $(3-j4)\text{ohm}$ - is connected in delta connection across a 3-phase, 230V balanced supply. Calculate the line and phase currents in the delta connected load and the power delivered to the load?
 ii. In power measurement of 3-phaseload connected by 3-phase supply by two wattmeter method, prove the following for leading power factor loads. **(May 06)**

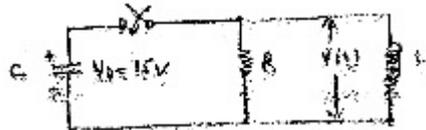
27. i. Three identical resistances are connected in a star fashion against a balanced three phase voltage supply. If one of the resistance is removed, how much power is to be reduced?
 ii. A 3-phase load has a resistance of 10ohm in each phase and is connected in
 a. star and
 b. delta against a 400V, 3-phase supply. Compare the power consumed in both the cases.
 iii. What is the difference between RYB phase sequence with RBY phase sequence? **(May 06)**
28. i. Two resistors each of 100ohm are connected in series. The phases a and c of a three phase 400V supply are connected to the two ends and phase b is connected to the junction of the two resistors. Find the line currents.
 ii. Derive the expressions for wattmeter readings in two wattmeter method with balanced star connected load. How do you calculate the power factor of the balanced load from wattmeter readings? **(May 06)**

UNIT-II

1. a) Explain the transient analysis of series R-C circuit having D.C. excitation (first order circuit).
 b) A circuit shown in figure 2 the switch K is Kept first at position 1 and steady state condition is reached. Is reached At $t = 0$ the switch is moved to position 2. Find the current value in both the cases. **[Jun-2014]**



2. a) Explain the transient analysis of series R-L circuit with sinusoidal excitation (first order circuit).
 b) In the figure 3 shown below a parallel RLC, circuit consisting of $R= 0.2 \Omega$ $L= 0.6 H$ and $C= 2F$. Capacitor Chas an initial voltage of 15V (polarity is shown in the figure). The switch K is closed at $t= 0$. Obtain the value of $v(t)$ **[Jun-2014]**



3. a) Define Bandwidth and Quality factor.
 b) A voltage $v(t) = 10 \sin \omega t$ is applied to a series RLC circuit. At the resonant frequency of the circuit, the maximum voltage across the capacitor is found to be 500V. Moreover the bandwidth is known to be 400rad/sec and the impedance at resonance is 100Ω . Find the resonant frequency, also find the values of L and C of the circuit. **[May-2013]**

4. a) Derive an expression for response in a R-C circuit excited by a d.c. source.
 b) A current of source shown in Figure.1 supplies a current
 $i(t)=0, t \leq 0$
 $= t, t > 0$.

Find $V_0(t)$. Use time domain method.

[April-May, 2012]

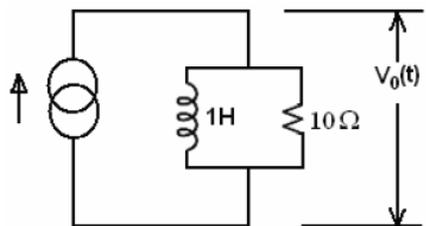


Figure.1

5. a) What are initial conditions? Explain the procedure to evaluate initial conditions.
 b) The switch in the Figure.1 has been connected to the 12 V source for a long time. At $t = 0$, the switch is thrown to 24 V source. Then
 i) Determine $i_L(0)$ and $v_C(0)$

ii) Write the differential equation governing $v_c(t)$ for $t > 0$

iii) Compute the steady state value of $v_c(t)$.

[April-May, 2012]

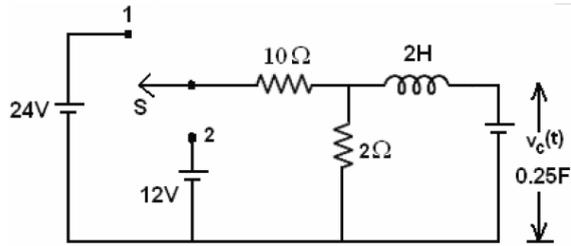


Figure.1

6. a) Derive an expression for response of R-L-C series circuit excited by a D.C. excitation.
 b) In the circuit shown in the Figure.1 below, the voltage across the circuit is $e_g(t) = 2.5t$ volts.

What are the values of $i(t)$ and $V_L(t)$ at $4s$?

[April-May, 2012]

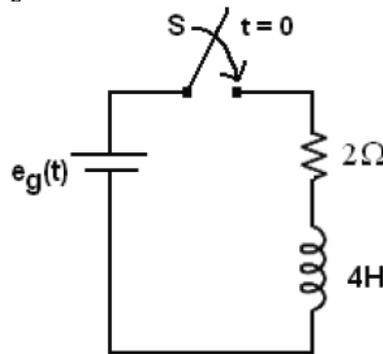


Figure.1

7. a) Derive the expression for the response in a R-L circuit for D.C. excitation. Define time constant.
 b) For the circuit given in Figure.1, steady state conditions are reached for the switch K in position '1'. At $t = 0$, the switch is changed to position 2. Use the time domain method to determine the current through the inductor for all $t \geq 0^+$

[April-May, 2012]

[April-May, 2012]

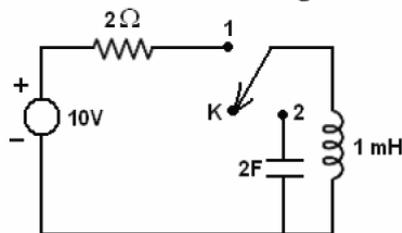


Figure.1

8. a) Derive an expression for response in a R-L series circuit for a sinusoidal excitation. Use Laplace transform approach.

[April-May, 2012]

[April-May, 2012]

b) For the circuit given below in Figure.2, the applied voltage is $V(t) = 10 \sin(200t + 60^\circ)$. Find the current through the circuit for $t \geq 0$. Assume zero initial condition. Use time domain approach.

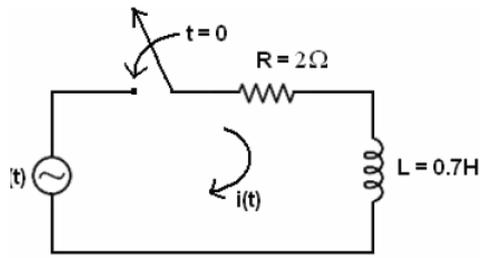


Figure.2

9. a) Derive the expression for the response of an RLC series circuit for sinusoidal excitation.
 b) For the circuit shown in Figure.2 determine the particular solution for $i(t)$ through the circuit. Assume zero initial conditions. [April-May, 2012]

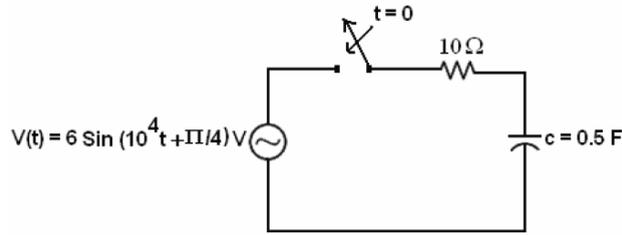


Figure.2

10. Derive an expression for the response in the system in Figure.2 by time domain and Laplace transform techniques. Cross check the answer. $V(t)=5\text{Sin}(10^3t+\pi/6)$ [April-May, 2012]

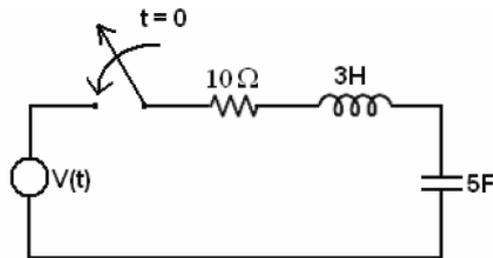


Figure.2

11. a) For the network shown in the Figure.2, steady state is reached with the switch open. At $t = 0$, the switch is closed. Determine current $i(t)$ for $t \geq 0$. [April-May, 2012]

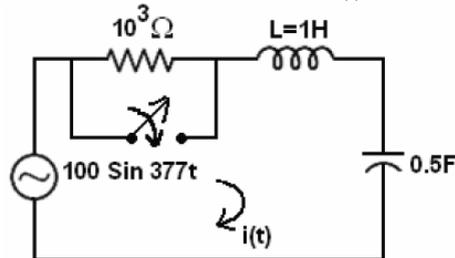


Figure.2

- b) For the circuit shown in the Figure.3, find $i(t)$. Assume zero initial conditions. Use Laplace transform approach. The switch is closed at $t = 0$. [April-May, 2012]

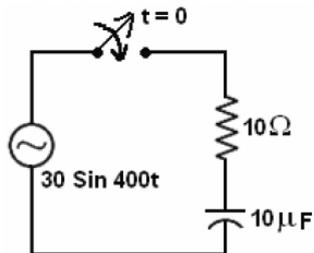


Figure.3

12. In the circuit given below (shown in Figure.1) switch 'k' is put in position – 1, for 1 m Sec. and then thrown to position – 2. Find the transient current in both intervals.

[Dec-2011]

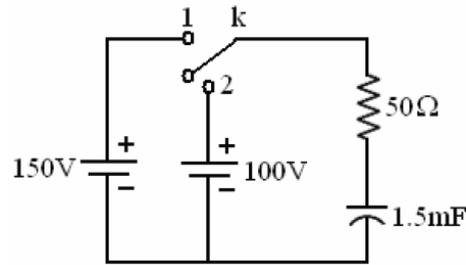


Figure.1

13. Obtain the expression for $i(t)$ when the switch 'S' is closed at $t=0$ (shown in Figure.1). Discuss the three cases of over damped, under damped and critically damped conditions. Sketch the voltage variation across each element. [Dec-2011]

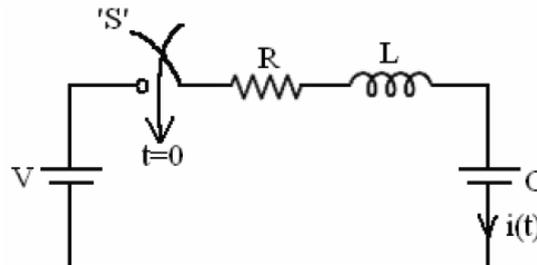


Figure.1

14. In the circuit shown in Figure.1 the switch is closed on the position – 1 at $t=0$ there by applied a D.C. voltage of 150V to series R-L circuit. At $t = 500\mu\text{Sec}$, the switch is moved to position-2 obtain the expression for current $i(t)$ in the both intervals sketch $i(t)$.

[Dec-2011]

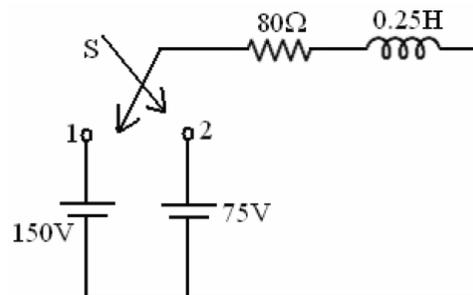


Figure.1

15. In the circuit given below (shown in Figure.1) switch 'k' is put in position – 1, for 1 m Sec and then thrown to position-2. Find the transient current in both intervals.

[Dec-2011]

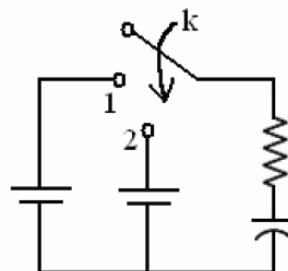


Figure.1

16. Write short notes on Laplace transform method of solving transient circuits.

[Dec-2011]

17. a) Derive the expression for the transient response in an RLC series circuit excited by a DC source.
 b) A constant voltage is applied to a series RL circuit at $t = 0$. The voltage across the inductor at $t = 3.46$ ms is 20 V and 5 V at $t = 25$ ms. Obtain R if $L = 2$ H. [Apr/May, 2011]

18. a) The circuit shown in the figure 1 has no stored energy. Find the Laplace transform of current supplied by the battery up on the closure of switch at $t = 0$. Hence find the initial and final values of the current.

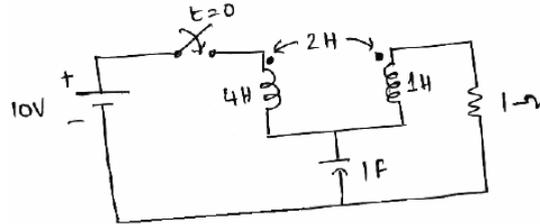


Figure 1

- b) Explain the procedure adopted for the evaluation of initial conditions.

[Apr/May, 2011]

19. a) A current source of the figure 1 shown below supplies at current $i(t) = 0, t \leq 0$
 $i(t) = t, t > 0$. Find $V_o(t)$

[Apr/May, 2011]

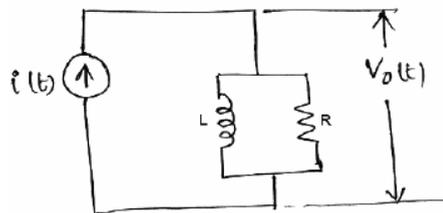


Figure.1

20. a) Derive the expressions for the transient current of RL series circuit when excited by a dc voltage.
 b) The network shown in figure 1 the switch in position 1 at $t = 0$ and after 200 ms it is moved to position 2. What is the expression for the current flowing through the capacitor?

[Apr/May, 2011]

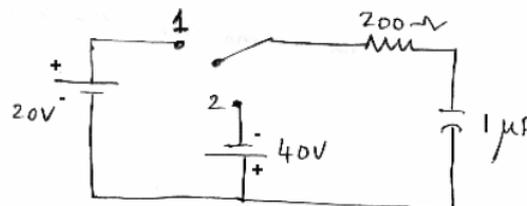


Figure.1

21. Derive the transient response of RLC series circuit with sinusoidal input.

[Dec-2011]

22. A sinusoidal voltage of $100\sin 50t$ is applied to a series circuit of $R = 15\Omega$ and $L = 2.5$ H at $t=0$ (shown in Figure.2). By Laplace transform method, determine the current $i(t)$ for all $t \geq 0$. Assume zero initial conditions.

[Dec-2011]

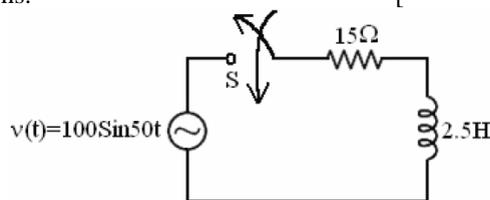


Figure.2

23. A sinusoidal voltage of $75\sin 30t$ is applied to a series circuit of $R = 20\Omega$ and $L = 1.5H$ at $t=0$ (shown in Figure.2). By differential equation method, determine the current $i(t)$ for all $t \geq 0$. Assume zero initial conditions. [Dec-2011]

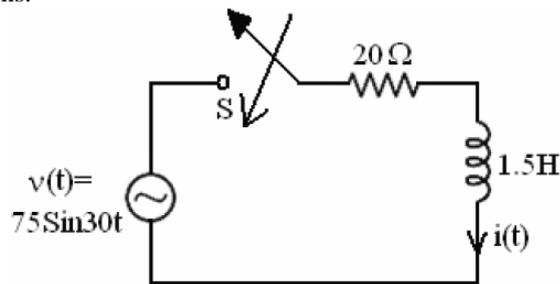


Figure.2

24. A sinusoidal voltage of $105\sin 40t$ is applied to a series circuit of $R = 25\Omega$ and $L = 1.5H$ at $t = 0$ (shown in Figure.2), by Laplace transform method. Determine the current $i(t)$ for all $t \geq 0$. Assume zero initial conditions. [Dec-2011]

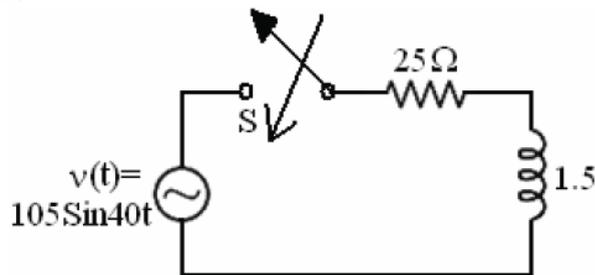
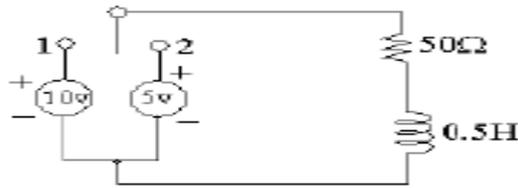
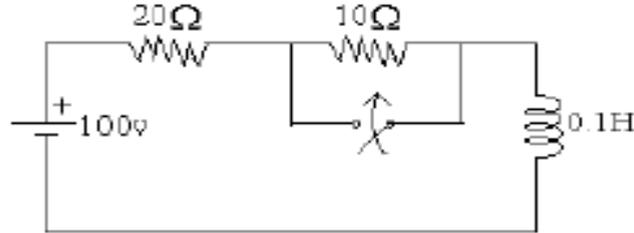


Figure.2

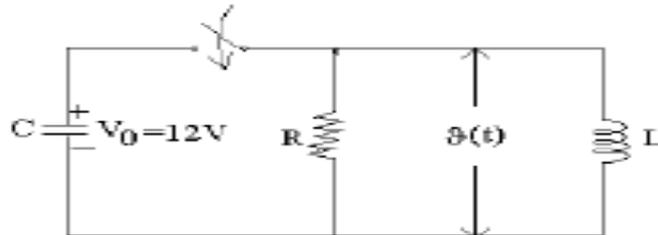
25. a) A series RLC circuit with $R = 10 \Omega$, $L = 0.1 H$ and $C = 2\mu F$ is excited by a source with $v(t) = 200 \cos(250t + \pi/4)$. Determine the complete solution for the current when the circuit is closed at $t = 0$.
 b) Derive the expression for the transient response of RC series circuit excited by a sinusoidal excitation. Use Laplace transform approach. [Apr/May, 2011]
26. a) Derive expression for transient response of RC series circuit excited by a sinusoidal source.
 b) A series RL circuit with $R = 50 \text{ ohms}$ and $L = 0.2 H$ has a sinusoidal voltage source $V = 150 \sin(500t + \phi)$ volts applied at a time when $\phi = 0$. Find the expression for the total current. Use Laplace transforms method. [Apr/May, 2011]
27. a) Derive the expression for the transient response of an RLC series circuit excited by a sinusoidal source.
 b) A sinusoidal voltage of $12 \sin 8t$ Volts is applied at $t = 0$ to a RC series of $R = 4\Omega$ and $L = 1 H$. By Laplace transform method determine the circuit current $i(t)$ for. Assume zero initial condition. [Apr/May, 2011]
28. a) Derive expression for the transient response of an RL series circuit excited by sinusoidal excitation.
 b) A series RC circuit with $R = 100 \Omega$ and $C = 25 \mu F$ has a sinusoidal excitation $V(t) = 250 \sin 500t$. Find the total current assuming that the capacitor is initially uncharged. [Apr/May, 2011]
29. Derive the expression for transient response of RLC series circuit with unit step input. (May 08)
30. In the figure, the switch is close at position 1 at $t = 0$. At $t = 0.5 \text{ m sec}$. The switch is moved to position 2. Find the expression for the current in both the conditions and sketch the transient. (Feb 08, May 06)



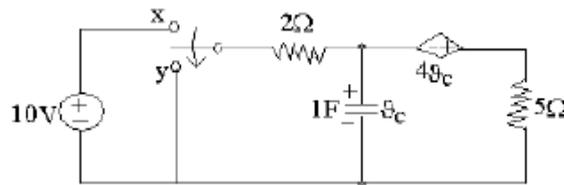
31. i. A dc voltage of 100V is applied in the circuit shown in figure and the switch is kept open. The switch K is closed at $t = 0$. Find the complete expression for the current. **(Feb 08, May 07, Sep, May 06)**



- ii. A dc voltage of 20V is applied in a RL circuit where $R = 5\text{ohm}$ and $L = 10\text{H}$. Find
 a. The time constant
 b. The maximum value of stored energy.
32. i. A resistance R and a $3.5\ \mu\text{F}$ capacitor is connected in series across a 230V dc supply. A voltmeter is connected across the capacitor. Calculate R , so that the voltmeter reads 165V at 5.65 sec. after closing the switch.
 ii. In a series RLC circuit $R = 7\text{ohms}$, $L = 1\text{H}$ and $C = 1\text{F}$ a dc voltage of 50V is applied at $t = 0$. Obtain $i(t)$ and I_{max} . **(Feb 08)**
33. As shown in figure represents a parallel RLC circuit where $R = 0.1\Omega$, $L = 0.5\text{H}$ and C is 1F. Capacitor C has an initial voltage of 12V as per the polarity shown in figure. The switch K is closed at time $t = 0$. Obtain $i(t)$. **(Feb 08)**

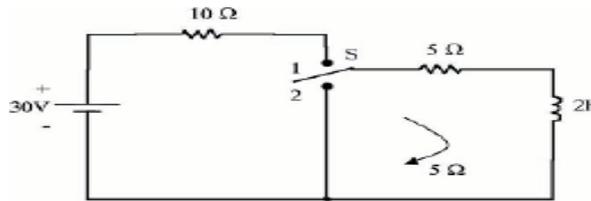


34. Find $v_c(t)$ at $t = 0 +$ while the switching is done from x to y at $t = 0$. as shown in figure below,

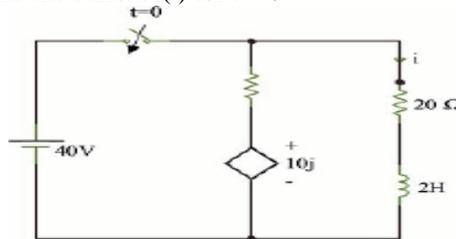


35. Derive an expression for the current response in R-L series circuit with a sinusoidal source. **(May 08)**
36. i. A direct voltage of 200V is suddenly applied to series RL circuit having $R = 20\ \Omega$ and inductance 0.2H. Determine the voltage drop across the inductor at the instance of switching on and at 0.03 sec later.
 ii. A constant voltage of 100V is applied at $t = 0$ to a series RC circuit having $R = 5\text{M}\ \Omega$ and $C = 20\ \mu\text{F}$. Assuming no initial charge to the capacitor, and expression for i , voltage across R and C . **(May, 07)**
37. Derive the expression for $i(t)$ for R-L series circuit when excited by a sinusoidal source. **(May, 03)**
38. For R-L-C series circuit with $R = 10\ \Omega$, $L = 0.2\text{H}$, $C = 50\ \mu\text{F}$, determine the current $i(t)$ when switch is closed at $t = 0$ applied voltage is $V(t) = 100 \cos(1000t + 60^\circ)$ **(May, 04)**

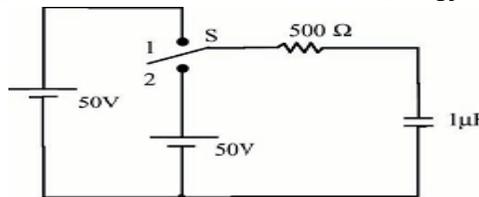
39. Find $i(t)$ for $t > 0$ whether the switch is moved from position 1 to 2 at $t=0$. The switch was in position 1 for a longtime. (May, 02)



40. Switch is opened at $t=0$ find the current $i(t)$ for $t > 0$ (May 02)



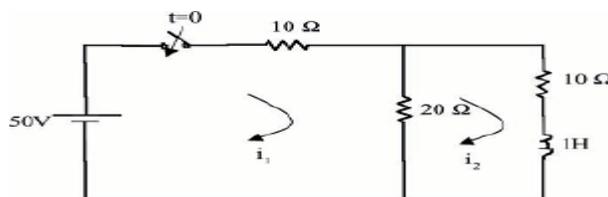
41. Switch 3 is moved from position 1 to 2 at $t = 0$ find the voltage $V_R(t)$ and $V_C(t)$ for $t > 0$ (May 02)



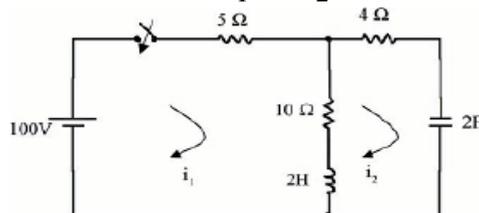
42. Compare the classical and laplace transform method of solution of the network. (May99)

43. What are the initial conditions? Why do you need them? (May95)

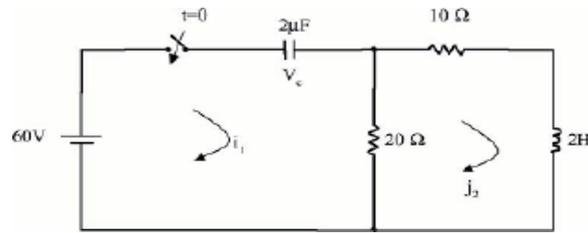
44. Assuming zero initial conditions find i_1 and i_2 in the network shown using laplace transform method. (May95)



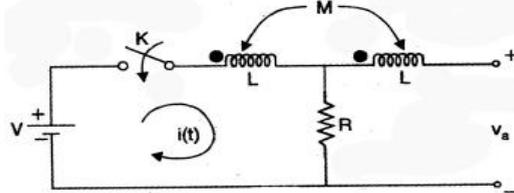
45. Draw the network in laplace domain and find $i_1(t)$ & $i_2(t)$ (May94)



46. Switch is closed at $t=0$ find the initial conditions at $t(0^+)$ for $i_1, i_2, V_C, di_1/dt, di_2/dt, d^2i_2/dt^2$ and d^2i_1/dt^2 (May94)

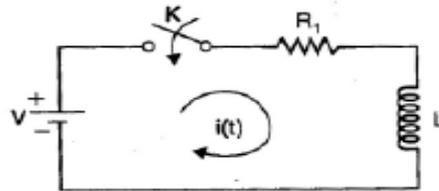


47. In the circuit shown, the switch K is closed at $t = 0$. Determine the value of V_a , V_a^1 and V_a^{11} at $t = 0^+$.



(BU Mar 98)

48. In the circuit shown below, the switch K is closed at $t = 0$, obtain an expression for $i(t)$ for $t > 0$. Determine the value of current after three time-constants, if $i_L(0^-) = 0$, $R = 10$ Ohms and $L = 1$ H.



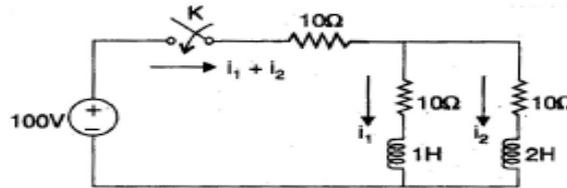
(BU Mar 98)

49. A constant voltage is applied to a series R-L circuit by closing a switch. The voltage across the inductance reads 25V at $t = 0$, and it drops to 5V at $t = 25$ msec. If $L = 1$ H, what must be the value of R ?

(BU Feb 97)

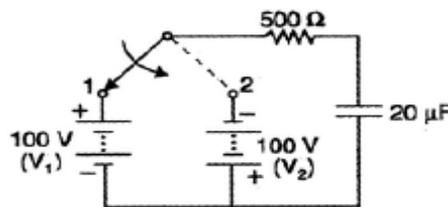
50. In the circuit shown in the fig., the switch K is closed at $t = 0$ with network previously unenergised. For the network element values shown on the diagram, find $i_1(t)$ and $i_2(t)$.

(BU Feb 97)



51. In the figure shown, the switch is closed on position 1 at $t = 0$. At time $t = RC$, the switch is moved to position 2. Calculate the current $i(t)$ in both intervals. Assume zero initial charge on the capacitor.

(BU Feb 96)

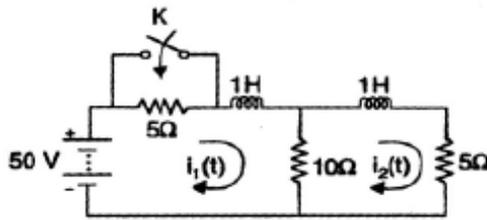


52. In a series R-L circuit, the steady state current is 10 A, when it is energised by 100V d.c. The time constant is 100 ms. Determine the current at time 150 ms after the switch is closed.

(BU Aug 96)

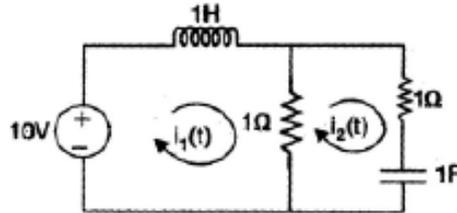
53. In the network shown in the figure, the network is in steady state with the switch K open. The switch is closed at $t = 0$. Find an expression for $i_2(t)$ for $t > 0$.

(BU Aug 96)



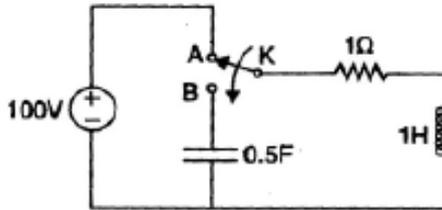
54. For the network shown in the figure,
 i. draw the transformed network
 ii. find the loop currents $I_1(s)$ and $I_2(s)$ and
 iii. find $i_1(t)$ and $i_2(t)$

(BU Feb 95)



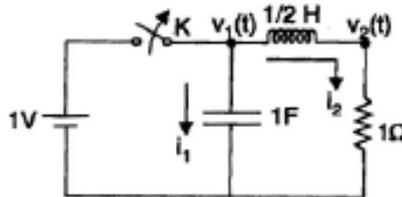
55. In the circuit shown, the switch is initially on A, and steady state has been reached. It is moved to position B at $t = 0$. Draw the transform network for $t \geq 0$ and find $I(s)$. use initial value theorem and find $i(0^+)$ and di/dt at $t(0^+)$.

(BU Aug 95)



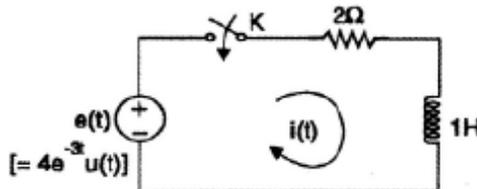
56. Find the node voltages $v_1(t)$ and $v_2(t)$ in the network given, using Laplace transform method, if the switch is opened at $t = 0$.

(BU Aug 95)



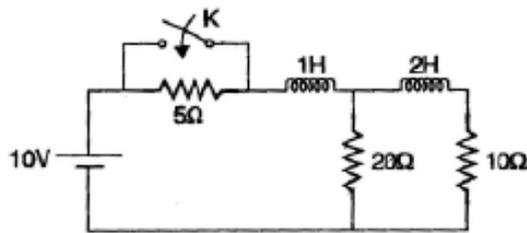
57. Find $i(t)$ in the network shown, using convolution integral. Assume zero initial conditions. Given $e(t) = 4e^{-3t} u(t)$.

(BU Aug 95)

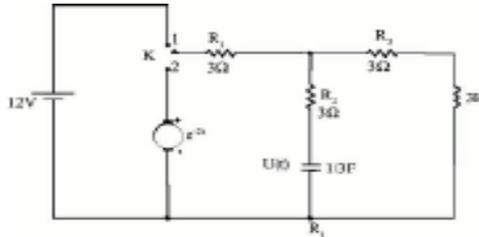


58. In the network shown in the figure, the switch K is closed at $t = 0$, steady state having been reached earlier. Find the current in the 10 Ohms resistor for $t > 0$, using Thevenin's theorem.

(BU Aug 94)

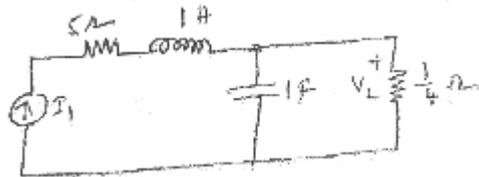


59. In the network shown in figure switch K is in position 1 until steady state is reached. Switch K is moved to position 2 at time $t = 0$, with switch in position 2, determine the current through the inductance. (IES 94)

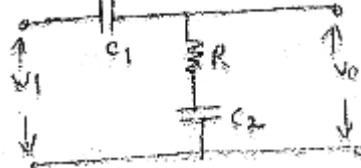


UNIT-III

1. a) Find the pole zero of the given network shown in figure 7a. [Jun-2014]



- b) Find the transfer function of the network shown in the figure 7b [Jun-2014]



2. a) Give the Significance of Poles and Zeros
 b) For the given network function, draw the pole zero diagram and hence obtain the time domain response $i(t)$. $I(s) = 5S / (S+1)(S^2+4S+8)$ [May-2013]

3. a) What is a pole-zero plot? What is its significance? Explain time domain behaviour from pole zero plot.

- b) Find $V_2(s)/V_1(s)$ for the network shown in Figure.4. [April-May, 2012]

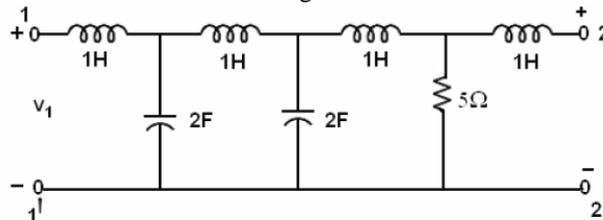


Figure.4

4. Write short notes on [April-May, 2012]
 a) Necessary conditions for transfer functions
 b) Time domain response of pole zero plot

5. a) What is a transfer function? Explain the necessary conditions for transfer functions.

$G_{12} \left[\frac{V_2(s)}{V_1(s)} \right]$

b) For the two port network shown in the Figure.4 find,

[April-May, 2012]

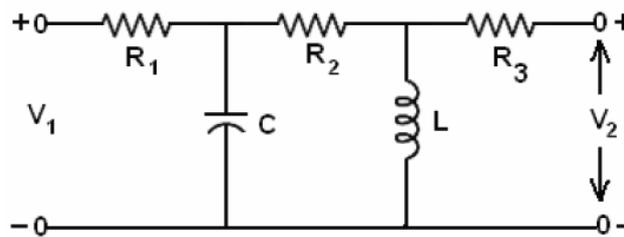


Figure.4

6. a) What is a driving point function? Explain the necessary conditions for driving point functions.

b) Find the transfer function $V_2(s)/V_1(s)$ for the circuit in Figure.5.

[April-May, 2012]

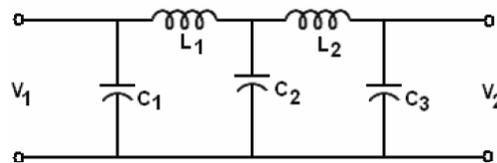


Figure.5

7. a) Explain the properties of driving point functions.

b) For the circuit given below (shown in Figure.2), determine current supplied by the source, total active & reactive powers also draw the phasor diagram.

[Dec-2011]

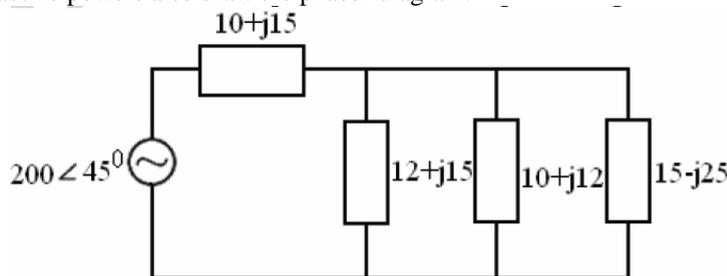


Figure.2

8. For the circuit given below (shown in Figure.3) determine the current through each element, source currents and total power dissipated.

[Dec-2011]

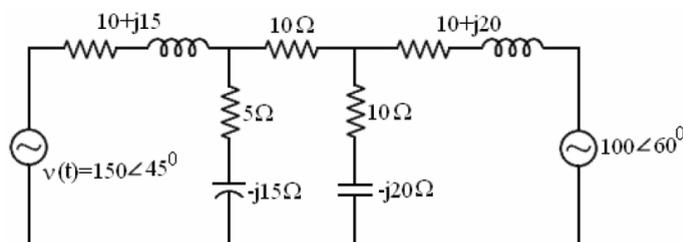


Figure.3

9. a) What is transform impedance & transform circuit?

b) For the circuit given below (shown in Figure.3) determine the current in each branch. Also draw the phasor diagram.

[Dec-2011]

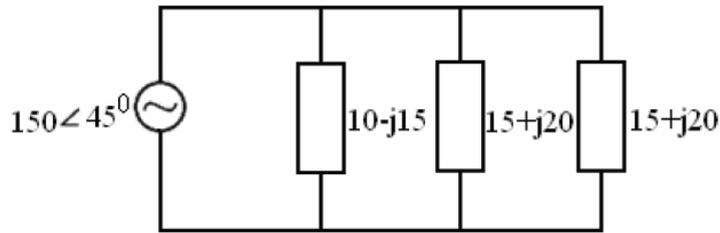


Figure.3

10. a) For the circuit given below (shown in Figure.4) determine current supplied by source & power factor. [Dec-2011]

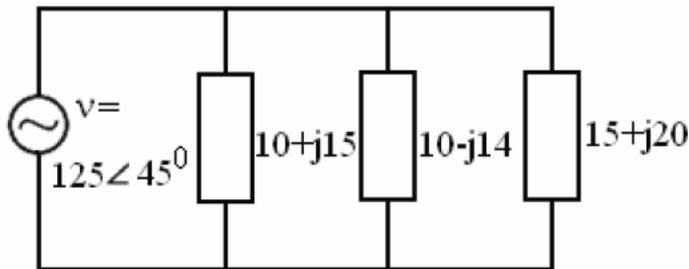


Figure.4

11. Write short notes on Driving Point Functions. [Dec-2011]
12. Write short notes on Poles and zeros of Networks Functions. [Dec-2011]
13. Write short notes on Transform impedance & Transform circuits. [Dec-2011]
14. a) Find the transform impedance of the network shown in below figure 2.
 b) What is a transfer function? Explain the necessary conditions for transfer functions. [Apr/May, 2011]

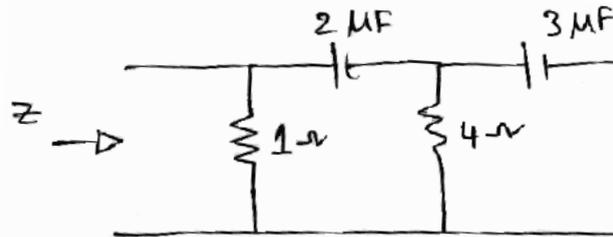


Figure 2

15. a) Explain the necessary conditions for driving point functions. [Apr/May, 2011]
 b) Find the transform impedance of the following circuit (figure 2).

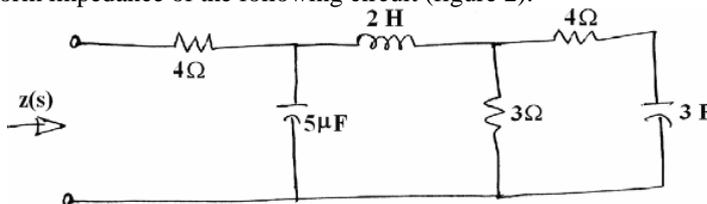


Figure 2

16. a) What is a transfer function? What are the properties of a transfer function?
 b) What are poles and zeros? Explain their significance. [Apr/May, 2011]
 c) Draw the pole-zero plots for a system with following network function.

$$Z(s) = \frac{(S^3 + 2s^2 + 3s + 2)}{(s^4 + 6s^3 + 8s^2)}$$

17. a) How can you assess the nature of time domain response from pole-zero plot? Explain.
 b) Find the transform impedance of the following circuit shown in figure 1.

[Apr/May, 2011]

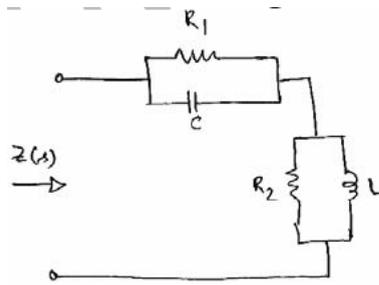
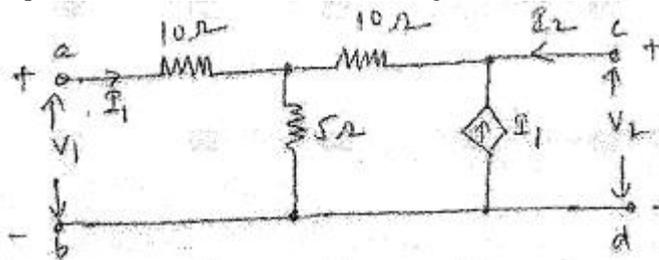


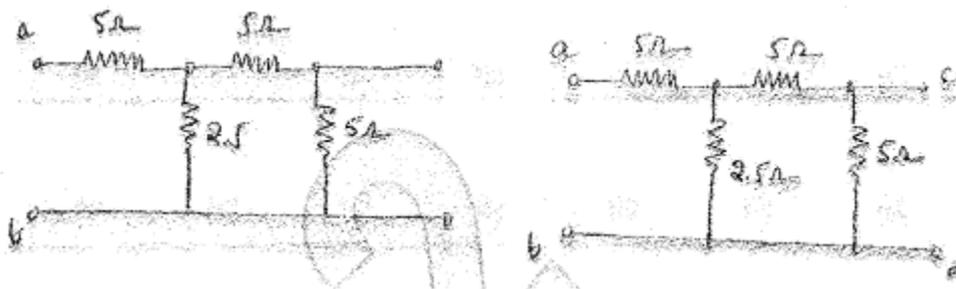
Figure 1

UNIT-IV

1. a) Find the Z- parameters of the network shown in figure4. [Jun-2014]

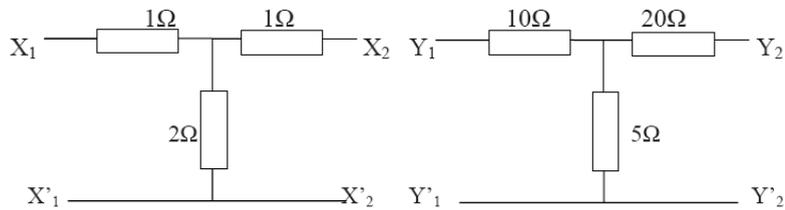


2. b) Represent h- parameters in terms of Z-parameters, Y parameters and ABCD parameters. [Jun-2014]
 a) Explain the concept of series connection and cascade connection of 2-port networks. [Jun-2014]
 b) Two networks have been shown in the figure 5. Obtain the transmission parameters of the resulting network when both the circuits are in cascade. [Jun-2014]



3. a) The Z parameters of a two port network are $Z_{11}=6\Omega$, $Z_{22}=4\Omega$, $Z_{12}=Z_{21}= 3\Omega$. Compute Y and ABCD Parameters and write the describing equations.
 b) Why Z-Parameters are known as Open circuit parameters. [May-2013]

4. a) Discuss in detail about series and parallel connection of two port networks
 b) Two networks shown below are connected in Series. Obtain the Z -parameters of the combination. [May-2013]



5. a) Express y-parameters in terms of h-parameters.
 b) Find the A B C D parameters for the circuit shown in Figure.3. [April-May, 2012]

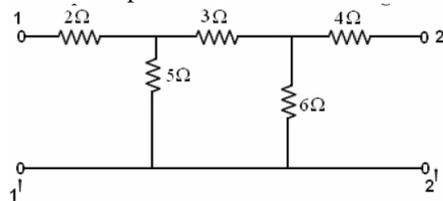


Figure.3

6. a) Express Z-parameters in terms of h-parameters.
 b) Find y-parameters for the circuit in Figure.3. [April-May, 2012]

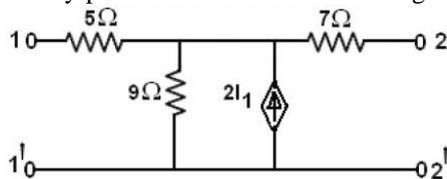


Figure.3

7. a) Express h-parameters in terms of ABCD parameters.
 b) Find the Z-parameters for the circuit in Figure.3. [April-May, 2012]

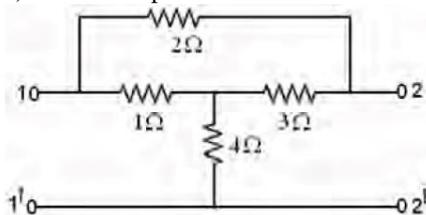


Figure.3

8. a) Express Z parameters in terms of ABCD parameters.
 b) Find the h-parameters for the circuit in Figure.4. [April-May, 2012]

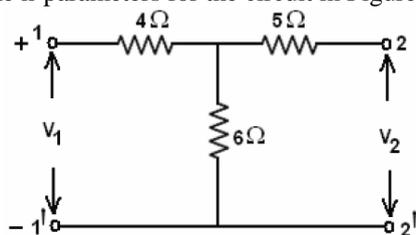


Figure.4

9. Write short notes on:
 a) Transmission parameters of cascaded networks
 b) m-derived filters
 c) Driving point functions. [April-May, 2012]

10. a) Define and explain the following
 i) port ii) driving point functions

- ii) Transfer functions iv) poles v) zeroes.
 b) Find Y_{12} for the circuit in Figure.4.

[April-May, 2012]

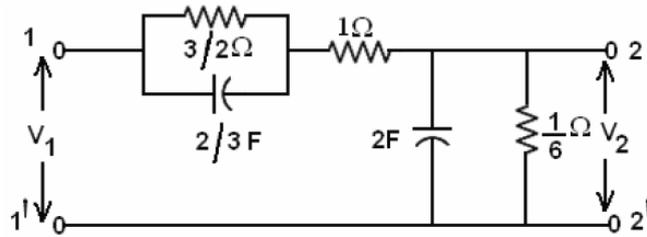


Figure.4

11. a) Determine the ABCD parameters of two networks connected in cascade as shown in Figure.7.

[April-May, 2012]

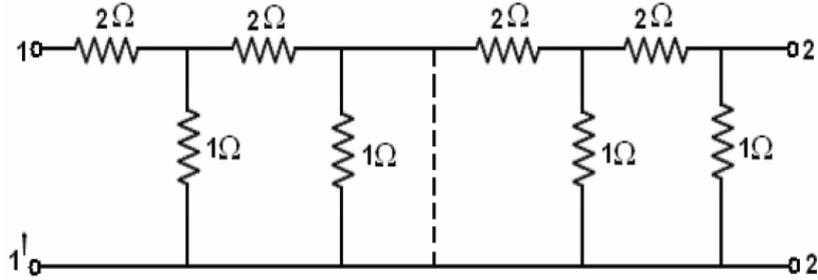


Figure.7

- b) Explain the steps involved in composite filter design.

12. For the two port network given below (Shown in Figure.3) determine ABCD & hybrid parameters.

[Dec-2011]

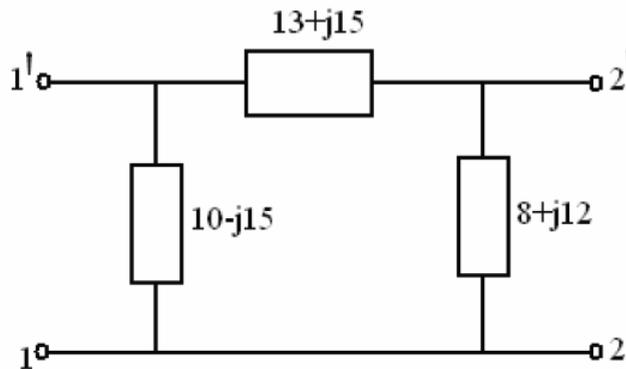


Figure.3

13. For the two port network given below (shown in Figure.4) determine Y and ABCD parameters.

[Dec-2011]

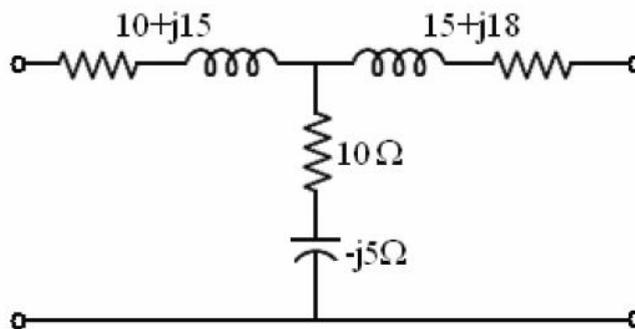


Figure.4

14. For the two port network given below (shown in Figure.4) determine Z and ABCD parameters.

[Dec-2011]

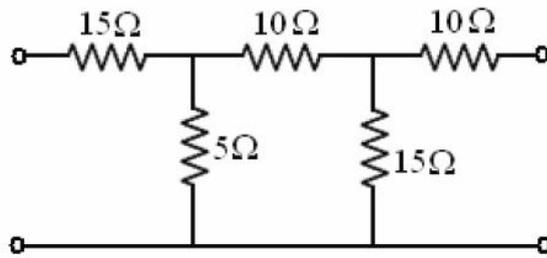


Figure.4

15. Determine Impedance and hybrid parameters of the following two port network (shown in Figure.3). [Dec-2011]

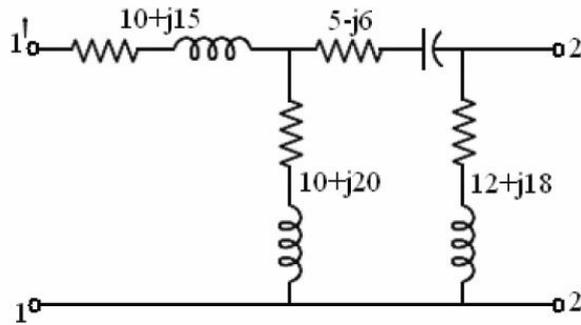


Figure.3

16. a) Find the relationship between z and h parameters. [Apr/May, 2011]
 b) For the following network shown in figure 2 determine Y parameters.

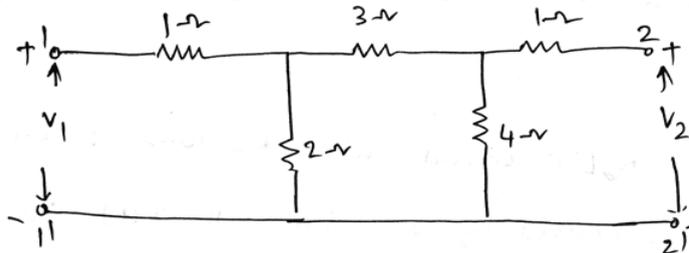


Figure 2

17. a) Express Y -Parameter in terms of $ABCD$ parameters. [Apr/May, 2011]
 b) Find the h -parameters for the following network shown in figure 2.

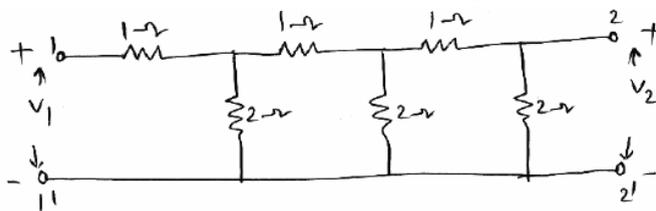


Figure 2

18. a) Express $ABCD$ parameters in terms of h - parameters. [Apr/May, 2011]
 b) Determine Y - parameters of the network shown in figure 3.

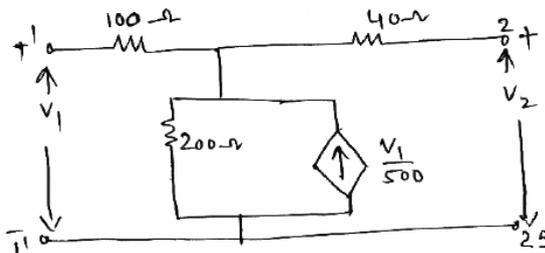


Figure 3

19. a) For the circuit shown in the figure 3 find Z and Y parameters. [Apr/May, 2011]

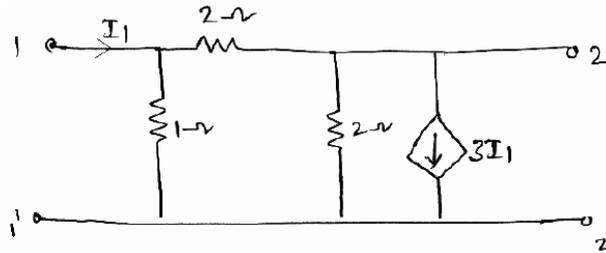


Figure 3

- b) Express Y – parameters in terms of h – parameters.
20. Derive expressions for ABCD parameters of two two-port networks connected in cascade. [Dec-2011]
21. Derive expressions for Impedance parameters of two two-port networks connected in series. [Dec-2011]
22. Derive expressions for transmission parameters of two two-port networks connected in cascade. [Dec-2011]
23. Derive expressions for Admittance parameters of two two-port networks connected in parallel. [Dec-2011]
24. Find the Y – parameters and ABCD parameters for the following network (figure 4). [Apr/May, 2011]

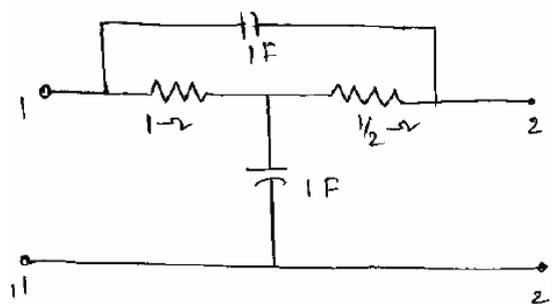


Figure.4

25. For the network shown in the figure 4. Find Y and Z – parameters. [Apr/May, 2011]

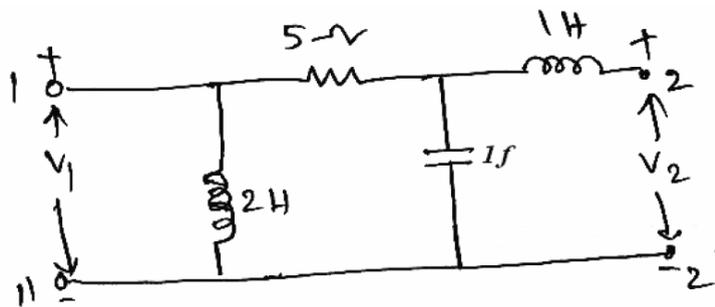


Figure.4

26. For the following network shown in figure 3 determine Y and Z parameters. [Apr/May, 2011]

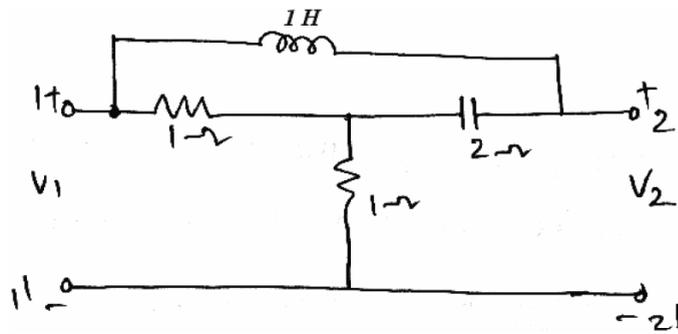
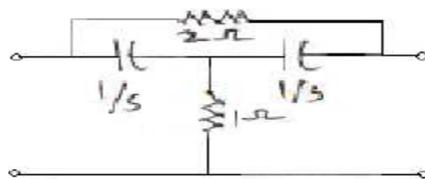


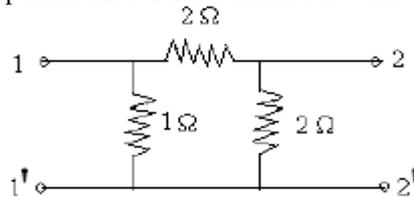
Figure.3

27. For the following network shown in figure 3 determine h-parameters and ABCD parameters. [Apr/May, 2011]

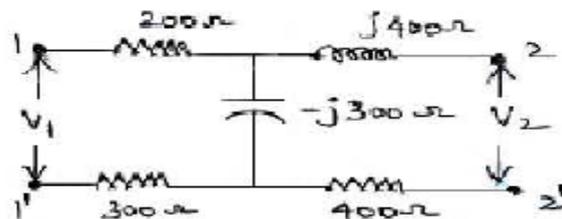
28. Find the Y - parameters for the bridged T-network as shown in figure. (May 08)



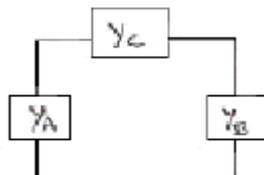
29. Find the Z and transmission parameters for the resistance n/w shown in figure. (May 08)



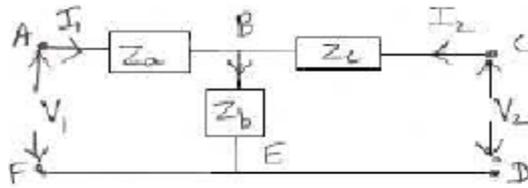
30. Find the transformed Z - parameters of the n/w shown in figure. (May 08)



31. i. Find the Y parameters of the pie shown in figure. (May 08)



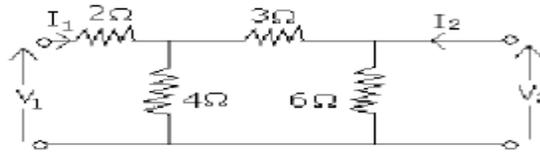
ii. Find the Z parameters of the T- network shown in figure. Verify the network is reciprocal or not.



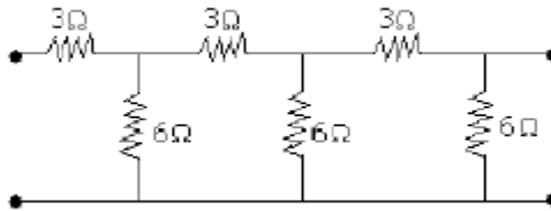
32. i. Determine the y-parameters of the network shown in figure. **(Feb 08)**
 ii. The Z-parameters of a two port network are $Z_{11}=15\text{ohms}$, $Z_{22}=24\text{ohms}$, $Z_{12}=Z_{21}=6\text{ohms}$. Determine
 a. ABCD parameters and
 b. equivalent T network.

33 Find the transformed Z - parameters of the n/w shown in figure. **(May 08)**

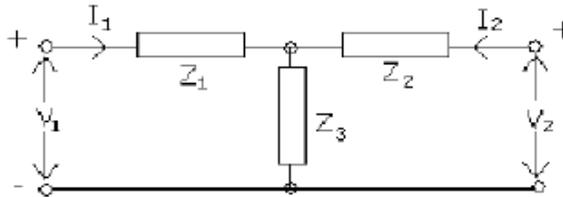
34. i. Determine the ABCD parameters of the network shown in figure. **(Feb 08, May 07, Sep 06)**



- ii. Determine the ABCD parameters of the network shown in figure

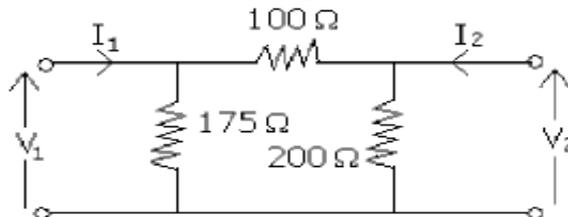


35. i. In a T network shown in figure, $Z_1 = 2\angle 0^\circ$, $Z_2 = 5\angle 90^\circ$, $Z_3 = 3\angle 90^\circ$, find the Z-parameters.

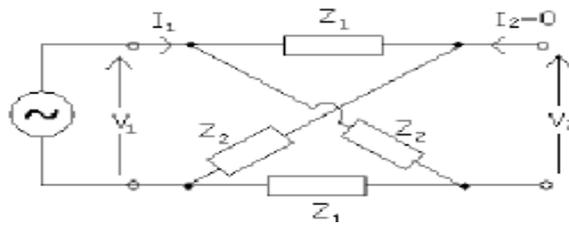


- ii. Z-parameters for a two port network are given as $Z_{11}=25\Omega$, $Z_{12}=Z_{21}=20\Omega$, $Z_{22}=50\Omega$. Find the equivalent T-network. **(Feb 08, May 07, 06)**

36. i. Find the y-parameters of the network shown in figure.

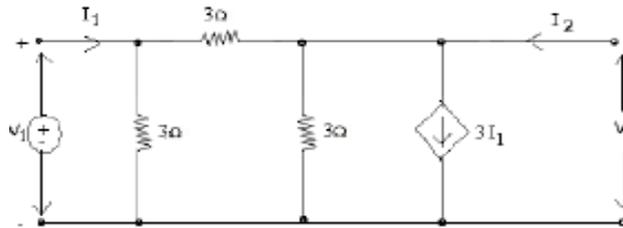


- ii. Calculate the Z-parameters for the lattice network shown in figure. **(May 07)**

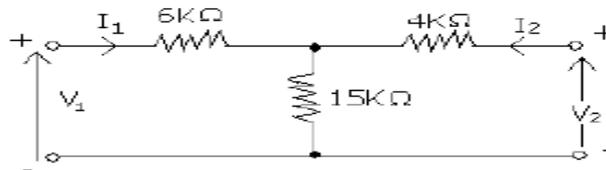


37. Determine Y-Parameters of the network shown in figure.

(Sep, May 06)

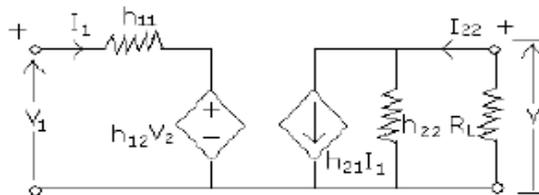


38. i. Find the Z-parameters for the network shown in figure.

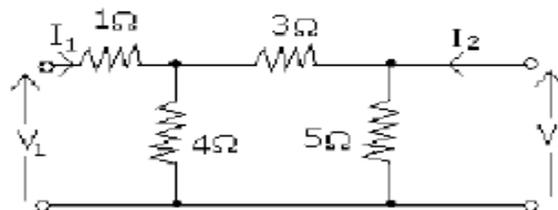


ii. For the h parameter equivalent network shown in figure find the voltage gain load resistance is R_L .

(Sep, May 06)



39. i. Determine the Z-parameter of the network shown in figure.



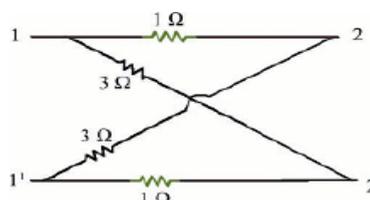
ii. The y-parameters of a two port network are $Y_{11}=0.6$ mho, $Y_{22}=1.2$ mho and $Y_{12}=-0.3$ mho.

- Determine the ABCD Parameters and
- Equivalent \square network.

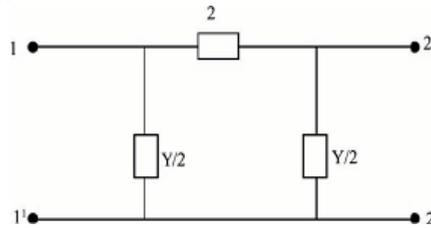
(May 06)

40. Determine z-parameters for

(03)

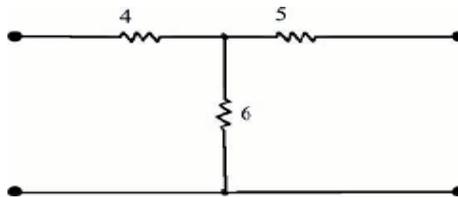


41. Determine T-parameters for (99)

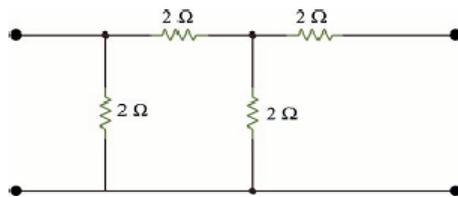


42. Obtain relation between h & T-parameters (98)

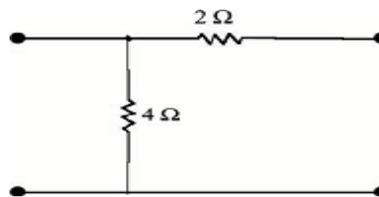
43. Find whether the following circuit is symmetrical or not? (98)



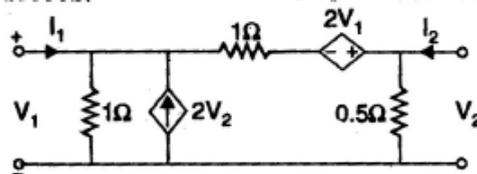
44. Find y-parameters for (97)



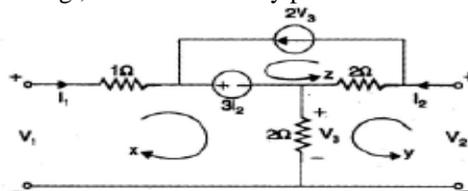
45. Find h-parameters for (94)



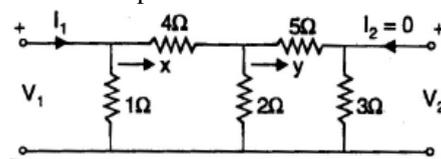
46. The network shown in the figure contains both dependent current source and dependent voltage source. For the element values given, determine the y and z parameters. (BU Feb 96, Mar 98)



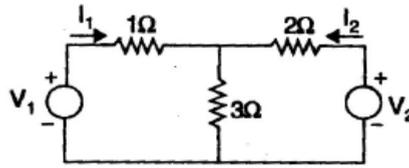
47. For the circuit shown in the fig., determine z and y parameters. (BU Feb 97)



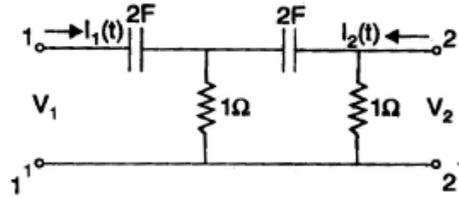
48. Determine z and y parameters of the 2-port network shown in the fig. (BU Aug 97)



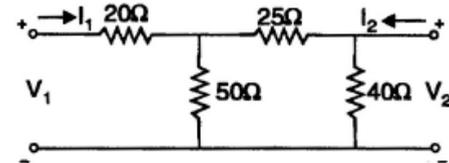
49. Determine h-parameters for the 2-port network shown in the figure. Also obtain its y - parameters. (BU Aug 96)



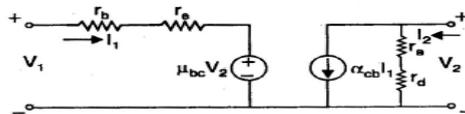
50. Determine the short-circuit admittance parameters for the RC ladder network shown in the figure. (BU Feb 95)



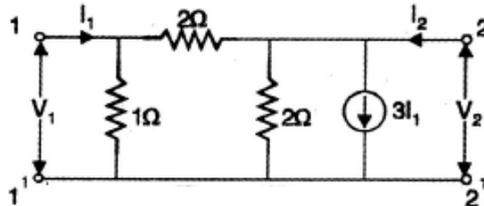
51. Find y and T parameters for the network shown in the figure. (BU Aug 95)



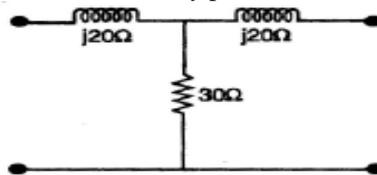
52. The model of a transistor in the CE mode is shown in the figure. Determine its h-parameters. (BU Aug 94)



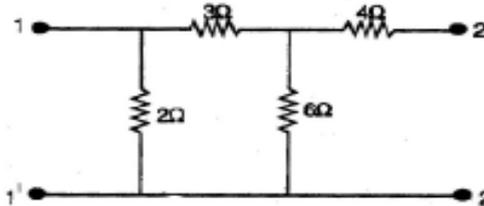
53. For the network shown in the fig. find z and y - parameters. (BU Aug 94)



54. For the network shown in fig. determine z and y parameters. (KU Dec 95)

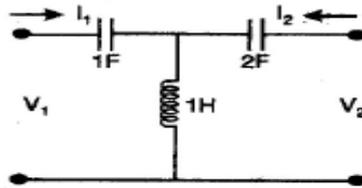


55. Determine y and h parameters for the circuit shown in fig. (KU Dec 95)

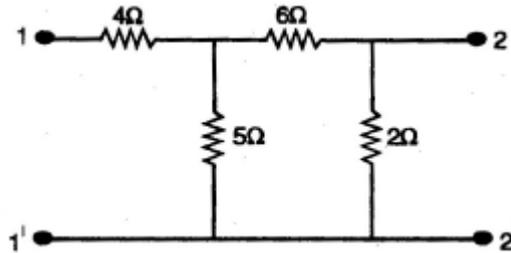


56. Determine y-parameters and h-parameters for the two-port network shown in fig. (KU Jun 95)

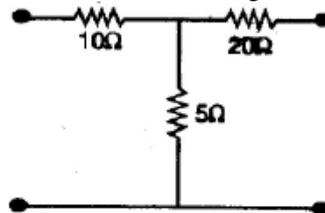
57. Determine the h-parameters after writing the transform network of fig. (KU May 95)



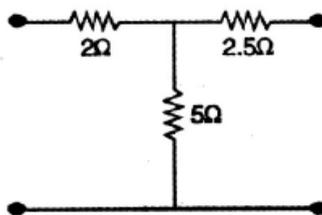
58. For the network shown in fig., find y parameters and ABCD parameters. (KU Dec 94)



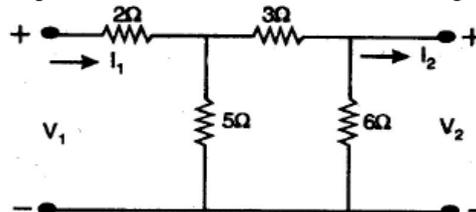
59. Find the ABCD parameters for the network shown in fig. (KU Dec 94)



60. Find the equivalent π -network for the T-network shown in fig. (KU Dec 94)



61. Determine the transmission parameters for the network shown in fig. (KU Jun 93)



62. Define the following networks functions:
 i. Driving point impedance
 ii. Transfer Impedance
 Obtain $V_{ab}(s) / V(s)$ for the network shown below: (GATE 02)

63. Draw a 2 port network whose y parameters are $y_{11} = -y_{12} = -y_{21} = y_{22} = 1s$.
 If two such 2 port networks are cascaded, determine the y parameter of the overall network. (IES 02)

64. A 2 port network N_1 has $z_{11} = z_{12} = z_{21} = z_{22} = 1 \text{ Ohm}$. A similar 2 port network N_2 is connected in cascade to N_1 , Determine the z-parameters of the composite network. (IES 02)

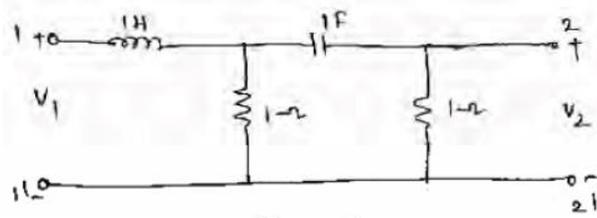


Figure 3

65. State the properties of driving point impedance of (i) LC Network (ii) RC network **(IES 92)**

66. A 2 port network made up of passive linear resistor is fed at port 1 by an ideal voltage source of V volts.

It is loaded at port 2 by a resistance R :

- i. With $V = 10$ volts and $R = 6$ Ohm currents of ports 1 and 2 were 1.44 and 0.2 A respectively.
- ii. With $V = 15$ V and $R = 8$ Ohm the current at port 2 was 0.25 A

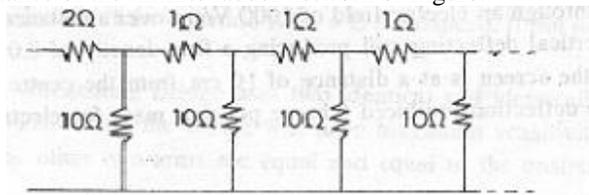
Determine the π equivalent circuit of the 2 port network.

(IES 99)

67. i. Derive expression for the hybrid parameters in terms of the Transmission parameters. Hence intercept the relation $AD - BC = 1$ in terms of hybrid parameters.

- ii. Find the input resistance of the infinite ladder network of Figure.

(IES 99)



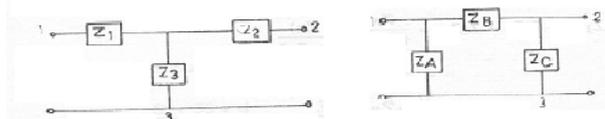
68. i. Define image impedance of a 2 port network and deduce their values in terms of transmission parameters.

- ii. The hybrid parameters of a two port network of figure shown below are $h_{11} = 1$ k Ohm, $h_{12} = 0.003$, $h_{22} = 50$ ohm and $h_{21} = 100$ Find V_2 .

(IES 98)

69. Given in figure are two network configurations. Show that one can be transformed into the other. Obtain the values of Z_1, Z_2, Z_3 in terms of Z_A, Z_B and Z_C as also the values of Z_A, Z_B and Z_C in terms of Z_1, Z_2, Z_3 if both the networks are equivalent to each other.

(IES 97)

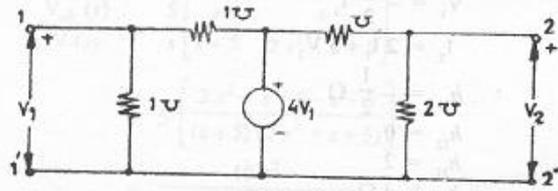


70. What do you understand by

- i. y-parameters, and
- ii. h-parameters of a 2 part network?

Find the y parameters of the network shown in figure.

(IES 95)



71. Define the terms driving point impedance, transfer impedance and transfer function of a network. The network shown in Figure is driven by a current source and is terminated by resistor at port 2. For this terminated 2 port network, calculate.
- transfer function $G_{21}(s)$, $a_{21}(s)$, $Z_{21}(s)$ and $Y_{21}(s)$, and
 - driving point impedance $Z_{11}(s)$ (IES 94)

- iv. Derive expressions for the y-parameter in terms of A, B, C, D parameters of a 2 terminal pair (4 terminal) network Two networks have general A, B, C, D parameters as follows: (IES 93)

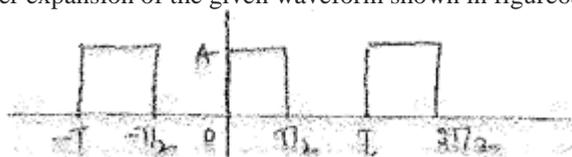
Parameter	Network 1	Network 2
A	1.50 Ohm	5/3
B	11 Ohm	4 Ohm
C	0.25 siemens	1 siemens
D	2.5	3.0

If the two networks are connected with their inputs and outputs is parallel, obtain the admittance matrix of the resulting network.

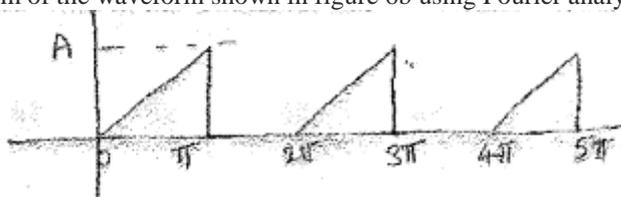
72. i. Explain what you understand by:
- Driving point impedance and transfer impedance of a network.
 - Poles and zero of a network function. Discuss restrictions on the pole zero location in the s-plane for driving point impedance functions.
- ii. A two terminal network consists of a coil having an inductor L and resistance R shunted by a capacitance C. The poles and zeros of the driving point function $Z(s)$ of this network are:
- Poles at
Zero at $-3 + j0$
If $Z(j0) = 1$, determine the values of R, L and C.
- iii. A 2 port network has:
- at port 1, driving point impedance of 60 Ohm and 50 Ohm with part 2 open circuit and short circuited respectively.
 - at port 2, driving point impedance of 80 Ohm and 70 Ohm with part 1 open circuited and short circuited respectively.
- Find the parameters of the network Derive the expressions used. (IES 92)

UNIT-V

- Explain the analysis of prototype band-pass filter. [Jun-2014]
 - Design a T- section constant K-high pass filter section having cut-off frequency of 20 kHz and design impedance of 800 Ω . Find its characteristics impedance and phase constant at 30 kHz. [Jun-2014]
- Obtain the Fourier expansion of the given waveform shown in figure6a. [Jun-2014]



- b) Find the line spectrum of the waveform shown in figure 6b using Fourier analysis. [Jun-2014]



3. a) Derive the expression for cutoff frequency in case of Constant K Low pass filter.
 b) Design a low pass filter (both T and π sections) having a cutoff frequency of 2 KHz to operate with a terminated load resistance of 500 Ω . [May-2013]
4. a) Explain the design procedure for a constant K low pass filter and its characteristics.
 b) Find the component values of a constant K LPF having characteristic impedance $Z_0 = 500\Omega$ and cut off frequency of $f_c = 500$ Hz. Find the frequency at which this filter produces an alternation constant of 38.2 dB. [April-May, 2012]
5. a) Give the analysis for the design of constant K band elimination filter and explain its characteristics.
 b) Design a constant K band elimination filter with cut off frequency 1750 Hz to 4250 Hz and a characteristic impedance of 250 Ω . [April-May, 2012]
6. Write short notes on [April-May, 2012]
 a) Composite filters
 b) m-derived low pass filter
7. a) Give the analysis for the design of constant-K band pass filter. [April-May, 2012]
 b) Design a prototype band pass filter section having cut off frequencies of 2000 Hz and 5000 Hz and nominal characteristic impedance of 600 Ω .
8. a) Explain the design procedure for constant K high pass filter for symmetrical T and Π sections and discuss its characteristics. [April-May, 2012]
 b) Find the component values of Π -section & T-section constant-K high pass filter having a cut off frequency of 8 kHz and nominal characteristic impedance of 500 Ω . Find its characteristic impedance and phase constant at $f = 12$ kHz and attenuation at $f = 1$ kHz.
9. a) Obtain the Fourier series expression of the wave form shown in Figure.5. [April-May, 2012]

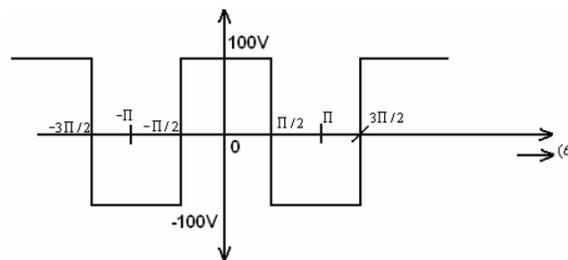


Figure.5

- b) For the non recurring cosine pulse $V = V_0 \cos t$ shown in the Figure.6, determine Fourier transform. Sketch continuous amplitude and phase spectra.

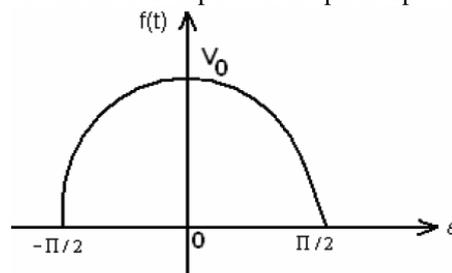


Figure.6

10. a) State and explain Fourier Theorem. [April-May, 2012]

b) Find the Fourier series of the wave form shown in Figure.5.

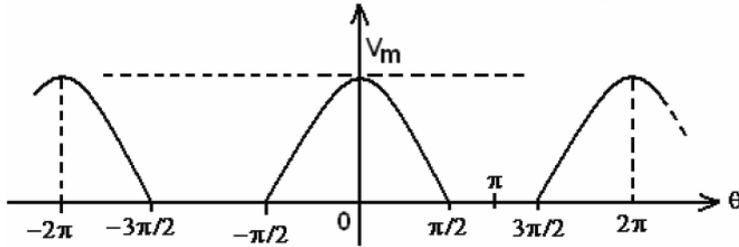


Figure.5

c) Find $g(w)$ for the following function.

$$f(t) = \begin{cases} 0 & -\infty \leq t \leq -T \\ \left[1 + \frac{t}{T}\right] & -T \leq t \leq 0 \\ \left[1 - \frac{t}{T}\right] & 0 \leq t \leq T \\ 0 & t > T \end{cases}$$

11. Write short notes on
 a) Properties of Fourier transforms.
 b) Consideration of symmetry in Fourier series evaluation

[April-May, 2012]

12. a) Find the trigonometric Fourier series of Figure.5.

[April-May, 2012]

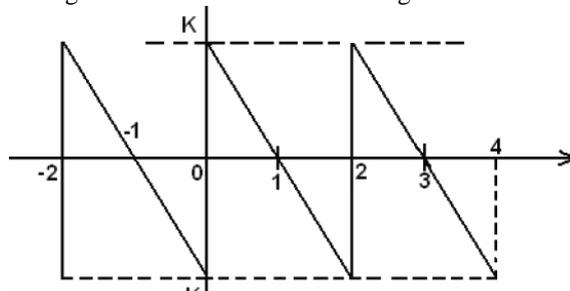


Figure.5

b) Find the Fourier transform of the following functions

- i) $f(t) = e^{-a/t}$ for all t
 ii) Unit impulse function $\delta(t)$

13. a) Find the exponential Fourier series of the wave form in Figure.6.

[April-May, 2012]

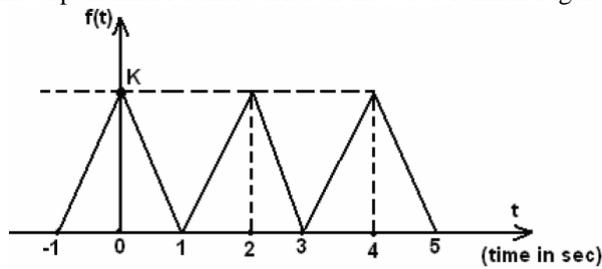


Figure.6

- b) Find the Fourier transform of the exciting voltage
 $v(t) = V_0 e^{-t}$ for $t \geq 0$.
 $= 0$ for $t < 0$
 Sketch approximately amplitude and phase spectra.

14. Draw the circuit diagram of a High pass filter. Explain the design procedure of the above filter in detail.
 [Dec-2011]

15. Draw the circuit diagram of a Band pass filter. Explain the design procedure of the above filter in detail. **[Dec-2011]**
16. Design a symmetrical T attenuator to give 2 dB attenuation to have a characteristic impedance of 150Ω. **[Dec-2011]**
17. Design a symmetrical T-attenuation to give 20 dB attenuation and to have characteristic impedance of 300Ω. **[Dec-2011]**
18. Write short notes on Low pass filter. **[Dec-2011]**
19. Write short notes on properties of Fourier transform. **[Dec-2011]**
20. Write short notes on
a) Phase angle spectra.
b) Fourier transform properties. **[Dec-2011]**
21. Write short notes on
a) Line and phase angle spectra
b) Fourier integrals **[Dec-2011]**
22. Write short notes on
a) Fourier transform theorems.
b) Exponential form of Fourier series **[Dec-2011]**
23. a) What is a band pass filter? Explain the general configuration and various parameters of constant-k band pass filters for T and Π-Sections.
b) What are the steps involved in design of composite filter? **[Apr/May, 2011]**
24. a) What is an m-derived filter? Explain the general configuration and parameters of m- derived low pass filter for T and Π-Sections.
b) Design an m derived high pass Π-Section filter having a cut off frequency 3250 Hz. The frequency of infinite attenuation may be taken at 2750 Hz. The characteristic impedance is 450Ω. **[Apr/May, 2011]**
25. a) What is high pass filter? Explain the general configuration and parameters of a constant – K high pass filter.
b) Design a constant - K T – section and π- section high pass filter having cut off frequency $f_c = 10$ KHz and characteristic impedance $Z_0 = 600\Omega$. Also find the characteristic impedance at 25 KHz. **[Apr/May, 2011]**
26. a) Explain the general configuration and parameters of a constant - K low pass filter T and π - Sections.
b) Design a constant–K T-Section and π - section low pass filter having cut off frequency $f_c = 2\text{kHz}$ and normal impedance $Z_0 = 600 \Omega$. **[Apr/May, 2011]**
27. Design a band stop, constant – K filter with cut off frequencies of 4 KHz and 10 KHz and nominal characteristic impedance of 500 Ω. **[Apr/May, 2011]**
28. Design a band pass, constant – K filter with cut – off frequency of 4 KHz and nominal characteristic impedance of 500 Ω. **[Apr/May, 2011]**
29. Design a low pass constant – K (i) T – Section and (ii) π – section filter with cut – off frequency (f_c) 6 kHz and nominal characteristic impedance of 500 Ω. **[Apr/May, 2011]**

30. A high pass constant – K filter with cut – off frequency 40 kHz is required to procedure a maximum attenuation at 36 kHz when used with terminated resistance of 500 Ω. Design a suitable m – derived T – section. [Apr/May, 2011]

31. Design a band elimination filter having a design impedance of 600Ω and cut – off frequencies $f_1 = 2$ KHz and $f_2 = 6$ KHZ. Design a m – derived high pass filter with a cut – off frequency of 10KHz; design impedance of 5Ω and $m = 0.4$. [Apr/May, 2011]

32. a) Determine the function $f(t)$ if the Fourier Transform of the function is

$$F(j\omega) = A e^{j\pi/2} \quad -\omega_0 < \omega < 0$$

$$A e^{-j\pi/2} \quad 0 < \omega < \omega_0$$

b) Determine the Fourier series of the wave form shown in figure.5 using Trigonometric series.

[Apr/May, 2011]

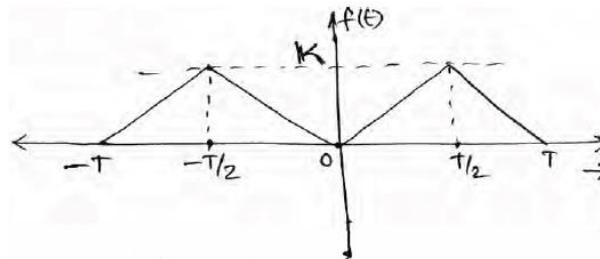


Figure 5

33. a) State and explain Fourier Theorem. [Apr/May, 2011]

b) The sweep voltage wave form is shown in the figure 4 given below. Find the exponential form of the Fourier series. Draw the frequency and phase spectrums.

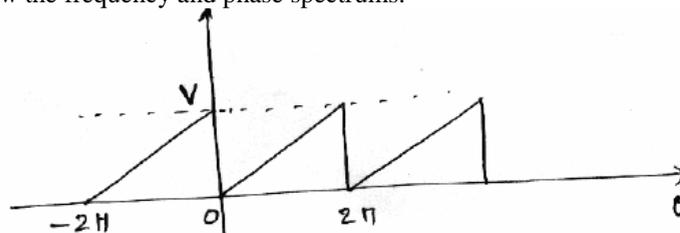


Figure.4

34. a) Find the exponential form of the Fourier Series expansion for the periodic rectangular pulse train shown in figure 4. Also draw frequency spectrum taking

$$\frac{T_p}{T} = \frac{1}{6}$$

[Apr/May, 2011]

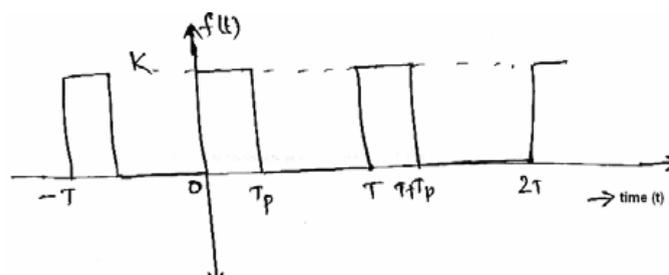


Figure.4

b) What are the properties of Fourier Transform?

35. a) What is Fourier transform? What are its properties?
b) Find the Fourier transform of the triangular wave shown in the figure 5 given below.
[Apr/May, 2011]

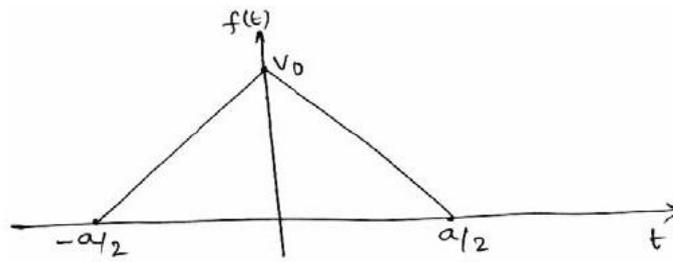
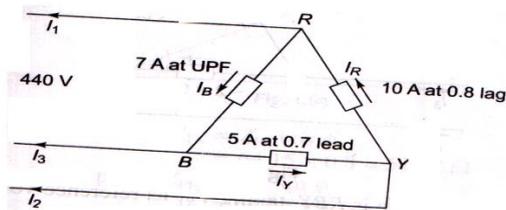


Figure 5

Assignment Questions

UNIT-I

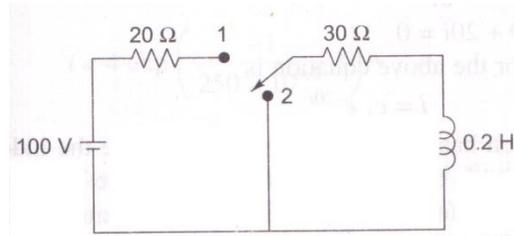
1. The phase voltage of a star-connected three-phase ac generator is 230V. Calculate the (i) Line voltage (ii) active power output if the line current of the system is 15 A at a power factor of 0.7 and (iii) active and reactive components of the phase currents.
2. A three-phase delta-connected RYB system with an effective voltage of 400V has a balanced load with impedances $3+j4\Omega$ calculate the (i) phase current (ii) line currents and (iii) power in each phase.
3. The power consumed in a three phase balanced star-connected load is 2 kW at a power factor of 0.8 lagging. The supply voltage is 400V, 50Hz. Calculate the resistance and reactance of each phase.
4. Calculate the total power input and reading of the two wattmeters connected to measure power in a three-phase balanced load if the reactive power input is 15 KVAR, and the load *pf* is 0.8
5. Two wattmeter's are connected to measure power in a three-phase circuit. The reading of the one of the Meter is 5kW when the load power factor is unity if the power factor of the load is changed to 0.707 lagging, without changing the total input power, calculate the readings of the two wattmeter's.
6. Find the line currents & the total power consumed by the unbalanced delta-connected load shown Fig.



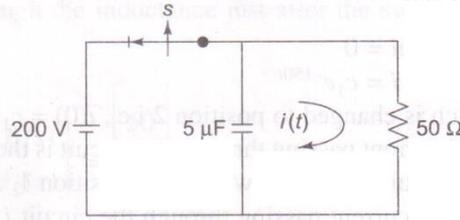
7. Explain the relationship between line and phase quantities in star and delta connected systems with phasor diagrams.
8. Explain the different methods to determine active and reactive power in a 3- ϕ circuit.

UNIT-II

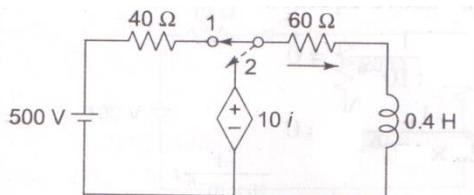
1. For the circuit shown in Fig. find the current equation when the switch is changed from position 1 to position 2 at $t=0$.



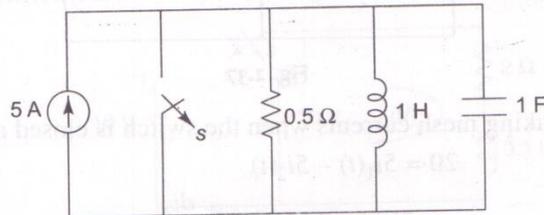
2. For the circuits shown in Fig., find the current equation when the switch is opened at $t=0$.



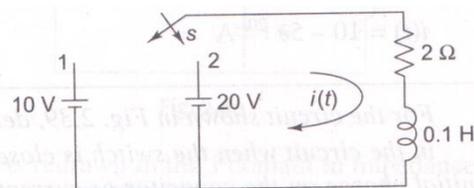
3. For the circuits shown in Fig., find the current equation when the switch is changed from position 1 to position 2 at $t=0$.



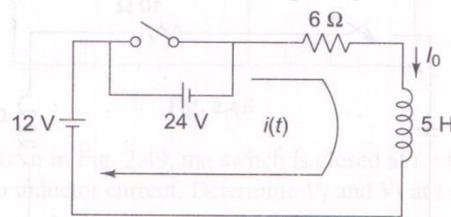
4. For the circuit shown in Fig., find the voltage across the 0.5Ω resistor when the switch S is opened at $t=0$. Assume there is no charge on the capacitor and no current in the inductor before switching.



5. For the circuits shown in Fig. determine the current when the switch is moved from position 1 to position 2 at $t=0$. The switch has been in position 1 for a long time to get steady state values.



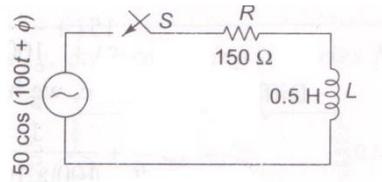
6. Find the current in the circuit shown in Fig. at an instant, after opening the switch if a current of 1 A had ben passing through the circuit at the instant of opening.



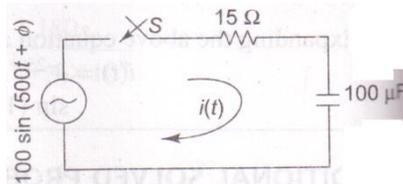
7. Derive an expression for response in a R-L, R-C and R-L-C circuit excited by a d.c. source.

8. Explain the procedure adopted for the evaluation of initial conditions.

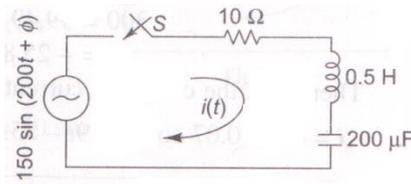
9. The circuit shown in Fig., consists of series RL elements with $R= 150\Omega$ and $L= 0.5\text{ H}$. The switch is closed when $\phi = 30^\circ$. Determine the resultant current when voltage $V= 50 \cos (100t + \phi)$ is applied to the circuit at $\phi = 30^\circ$



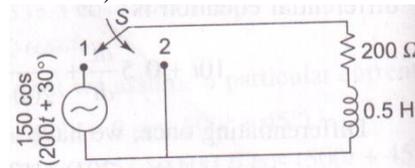
10. The circuit shown in Fig., consists of series RC elements with $R= 15\Omega$ and $C= 100\mu\text{F}$. A sinusoidal voltage $v= 100 \sin (500t + \phi)$ volts is applied to the circuit at time corresponding to $\phi= 45^\circ$, Obtain the current transient.



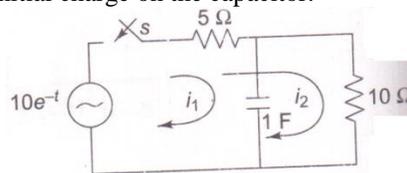
11. The circuit shown in Fig., consists of series RLC elements with $R= 10\Omega$, $L= 0.5\text{ H}$ and $C=200\mu\text{F}$. has a sinusoidal voltage $v= 150 \sin (200t + \phi)$ if the switch is closed when $\phi = 30^\circ$, determine the current equation.



12. For the circuit shown in Fig., determine the transient current when the switch is moved from position 1 to position 2 at $t= 0$. The circuit is in steady state with the switch in position 1. The voltage applied to the circuit is $v = 150 \cos (200t + 30^\circ)$ V.



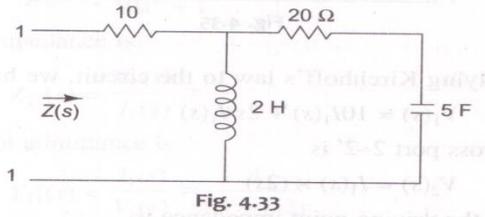
13. For the circuit shown in Fig. 3.24, determine the total current delivered by the source when the switch is closed at $t = 0$. Assume no initial charge on the capacitor.



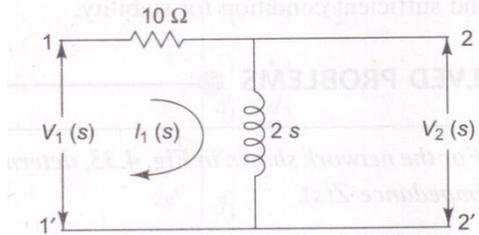
14. Derive the expression for the response of an RL ,RC and RLC series circuit for sinusoidal excitation.

UNIT- III

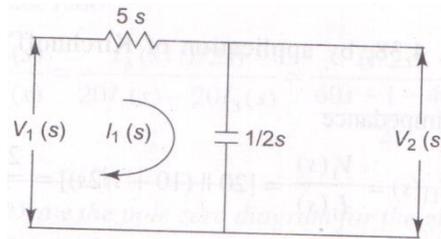
1. For the network shown in Fig. determine the transform impedance $Z(s)$



2. For the two port network shown in Fig. determine the driving point impedance $Z_{11}(s)$ and the driving point admittance $Y_{11}(s)$. Also find the transfer impedance $Z_{21}(s)$.



3. For the network shown in Fig. determine the transfer function $G_{21}(s)$ and $Z_{21}(s)$ and the driving point admittance.



4. Draw the pole zero diagram for the given network function $I(s)$ and hence obtain $i(t)$.

$$I(s) = \frac{20s}{(s+5)(s+2)}$$

5. Draw the pole zero diagram for the given network function and hence obtain $v(t)$.

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

6. For the given network function, draw the zero diagram and hence obtain the time domain response $i(t)$

$$I(s) = \frac{5s}{(s+1)(s^2+4s+8)}$$

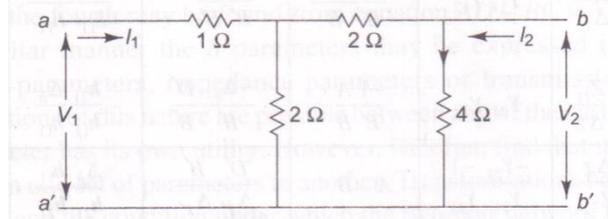
7. Explain the necessary conditions for driving point functions.

8. Explain the significance of on Transform impedance & Transform circuits

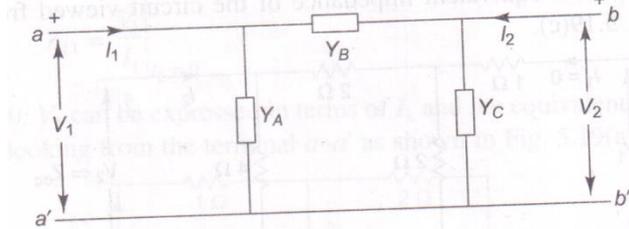
UNIT- IV

1. The impedance parameters of a two port network are $Z_{11} = 6\Omega$; $Z_{22} = 4\Omega$; $Z_{12} = 3\Omega$; $Z_{21} = 3\Omega$ Compute the Y parameters and ABCD parameters and write the describing equations.

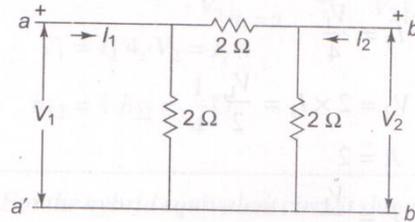
2. Find the Z parameters for the circuit shown in Fig.



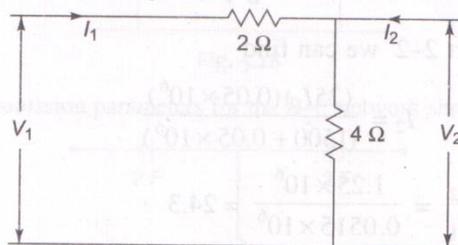
3. Find the short circuit admittance parameters for the circuit shown in Fig.



4. Find the transmission parameters for the circuit shown in Fig.



5. Find h parameters for the network in Fig.



6. Express Z-parameters in terms of ABCD and h-parameters.

7. Express ABCD parameters in terms of h – parameters.

8. Express Y-Parameter in terms of ABCD parameters.

9. 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.

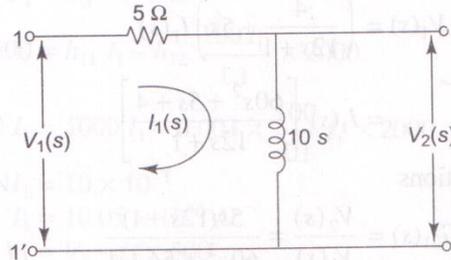
10. The port currents of a two-port network are given by

$$I_1 = 2.5V_1 - V_2$$

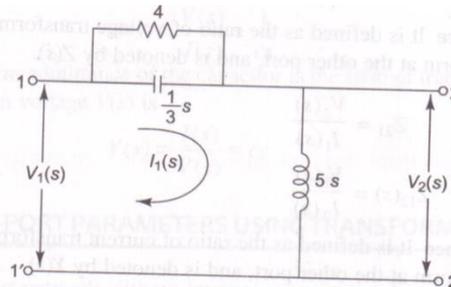
$$I_1 = -V_1 - 5V_2$$

Find the equivalent π - network.

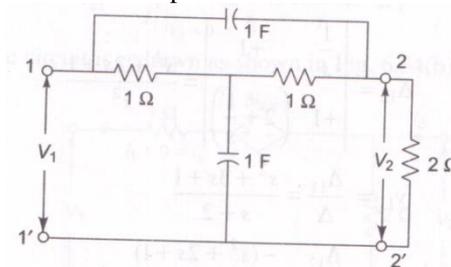
11. For the network shown in Fig. obtain the transfer function $G_{21}(s)$ and $Z_{21}(s)$ and driving point impedance.



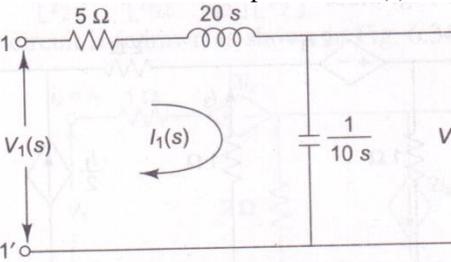
12. For the network shown in Fig. obtain the transfer function $G_{21}(s)$ and $Z_{21}(s)$ and driving point impedance $Z_{11}(s)$



13. For the bridged T network shown in Fig. find the driving point admittance y_{11} and admittance y_{21} With a 2Ω load resistor connected across port 2.



14. For the two port network shown in Fig. determine the driving point impedance $Z_{11}(s)$ and the driving point admittance $Y_{11}(s)$. Also find the transfer impedance $Z_{21}(s)$

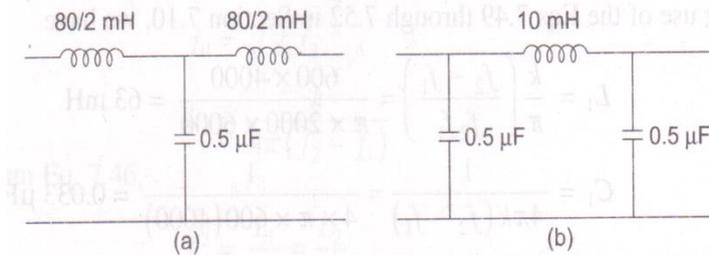


15. Explain the concept of transformed network.

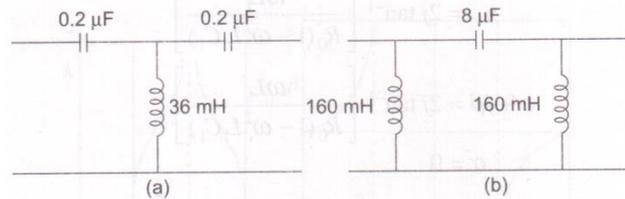
16. Explain the Transmission parameters of cascaded networks.

UNIT- V

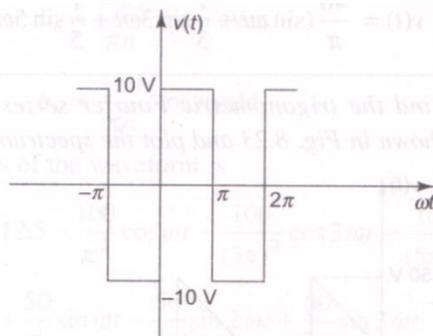
1. Design a low pass filter (both π and T- sections) having a cutoff frequency of 2 kHz to operate with a terminated load resistance of 500Ω .
2. Design a high pass filter having a cut- off frequency of 1 KHz with a load resistance of 600Ω .
3. Design k-type band pass filter having a design impedance of 500Ω and cut-off frequencies 1 kHz and 10 kHz.
4. Design a band elimination filter having a design impedance of 600Ω and cut-off frequencies $f_1=2\text{kHz}$ and $f_2 = 6\text{kHz}$.
5. Determine the cut-off frequency for the low pass filter shown in Fig.



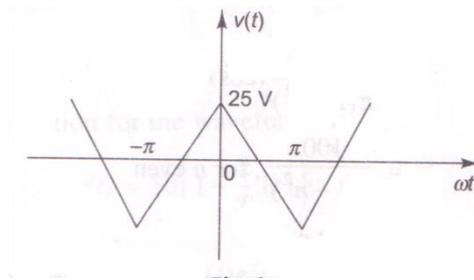
6. Determine the cut-off frequency for the high pass filter shown in Fig.



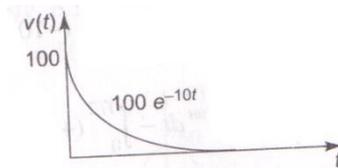
7. Give the analysis for the design of constant K low pass, high pass , band pass and band elimination filters and explain their characteristics.
8. Explain about m-derived low pass and high pass filters.
9. Find the Fourier series of the periodic function $v(t)$ as shown in Fig.



10. Find the exponential Fourier series of the triangular wave-form shown in Fig.



11. Obtain the Fourier transform of the function shown in Fig.



12. State and explain Fourier Theorem.
13. Explain Properties of Fourier transforms
14. Explain Line and phase angle spectra
15. Write short notes on exponential form of Fourier series