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Lecture Plan 1

Semester:-III Class-III ECS Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic :-Introduction to Two port network , Z & Y parameters .	Time Allotted:-
1.	**Introduction** If network consist of two pairs of terminals where one pair of terminals can be designated as input the other pair being output it is called two port network. For the two port network the input & output voltages can be expressed in terms of input & output currents.	5-10 min
2	**Division of the Topic** Network configuration -Parameter representation -Impedance matrix -Input & output driving point impedances -Reverse & forward transfer impedances.	25-30 min
3.	**Conclusion** The network being a conducting path through which electric current flows or intends to flow contains resistance, capacitance , inductance. These are called network elements. The Z & Y parameters are called open & short circuit parameters.	5 min
4	**Question / Answer** Q1.What is the difference b/w linear & non linear circuits? A1. In linear parameters remain constant with change in applied voltage ; In non linear parameters change with voltage or current. Q2.Define recurrent network? A2.A cascade of repeated sections of network is known as recurrent network.	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

Lecture Plan 2

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic :-Condition for reciprocity & symmetry for Z & Y parameters.	Time Allotted:-
1.	**Introduction** A network is said to be reciprocal if the ratio of the response variable to the excitation variable remains identical even if the positions of the response & excitation in the network are interchanged. A two port network is said to be symmetrical if the input & output ports can be interchanged without altering the port voltages & currents.	5-10 min
2	**Division of the Topic** -Condition for reciprocity for Z & Y parameters -Condition for symmetry for Z & Y parameters	25-30 min
3.	**Conclusion** The condition for reciprocity for Z parameters is $Z_{12} = Z_{21}$. The condition for reciprocity for Y parameters is $Y_{12} = Y_{21}$. The condition for symmetry for Z parameters is $Z_{11} = Z_{22}$. The condition for symmetry for Y parameters is $Y_{11} = Y_{22}$.	5 min
4	**Question / Answer** Q1. Differentiate b/w active & passive elements? A1. The circuit element has the capability of enhancing the energy level of a signal passing through it is called active element others are called passive elements. Q2.Write the condition for symmetry for Y parameters. A2. The condition for symmetry for Y parameters is $Y_{11} = Y_{22}$.	5 min

Assignment to be given:- NIL

Reference Readings:- :- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 3

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic :-Hybrid parameter representation , Condition for reciprocity & symmetry	Time Allotted:-
1.	**Introduction** h-parameter representation is widely used in modeling of electronic components & circuits particularly transistors. In hybrid parameters representation, the voltage of the input port & the current of the output port are expressed in terms of current of the input port & the voltage of the output port.	5-10 min
2	**Division of the Topic** -Hybrid parameter representation -Condition for reciprocity & symmetry	25-30 min
3.	**Conclusion** In hybrid parameters representation, the voltage of the input port & the current of the output port are expressed in terms of current of the input port & the voltage of the output port.	5 min
4	**Question / Answer** Q1. Define hybrid parameters. A1.In hybrid parameters, the voltage of the input port & the current of the output port are expressed in terms of current of the input port & the voltage of the output port. Q2.Write the condition for symmetry for h parameters. A2. The condition for symmetry for h parameters is $\Delta h = 1$.	5 min

Assignment to be given:- NIL

Reference Readings:- :- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 4

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic :- ABCD parameter representation , Condition for reciprocity & symmetry .	Time Allotted:-
1.	**Introduction** ABCD parameters are widely used in analysis of power transmission engineering where they are termed as "Generalized Circuit Parameters". In ABCD parameter representation, the voltage & the current of the input port are expressed in terms of voltage & current o the output port. Assuming the direction of output current opposite.	5-10 min
2	**Division of the Topic** -ABCD parameter representation -Condition for reciprocity & symmetry	25-30 min
3.	**Conclusion** In ABCD parameter representation, the voltage & the current of the input port are expressed in terms of voltage & current o the output port. Assuming the direction of output current opposite.	5 min
4	**Question / Answer** Q1. Define ABCD parameters. A1. In ABCD parameter representation, the voltage & the current of the input port are expressed in terms of voltage & current o the output port. Assuming the direction of output current opposite. Q2.Write the condition for symmetry for ABCD parameters. A2. The condition for symmetry for h parameters is A = D.	5 min

Assignment to be given:- NIL

Reference Reading :- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 5

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic :- Z parameters in terms of ABCD parameters & Cascade connection..	Time Allotted:-
1.	**Introduction** Z parameters can be expressed in terms of ABCD parameters by using the basic equations of Z & ABCD parameters.ABCD parameters are highly useful in characterizing cascaded two port networks .	5-10 min
2	**Division of the Topic** -Z parameters in terms of ABCD parameters & - Cascade connection	25-30 min
3.	**Conclusion** Z parameters can be expressed in terms of ABCD parameters by using the basic equations of Z & ABCD parametersThe overall ABCD parameter network matrix for cascaded network is the matrix product of ABCD matrices of individual network.	5 min
4	**Question / Answer** Q1.What do you understand by cascade connection. A1.When output of first network becomes the input for the second network, such type of interconnection is called cascade network. Q2.Which parameters are used for characterizing cascaded two port networks. A2. ABCD parameters.	5 min

Assignment to be given:- Express the Z- parameters in terms of Y- parameters and hybrid parameters

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 6

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic :- Series & parallel interconnections of two-port networks.	Time Allotted:-
1.	**Introduction** The open circuit impedance parameter is highly useful in characterizing the series connected two port networks. The short circuit impedance parameter is highly useful in characterizing the parallel connected two port networks .	5-10 min
2	**Division of the Topic** -Series interconnection of two-port network -Parallel interconnection of two-port network	25-30 min
3.	**Conclusion** The open circuit & short circuit parameters are highly useful in characterizing the series & parallel connected two port networks.	5 min
4	**Question / Answer** Q1.Which parameter is used for characterizing the series connected two port networks. A1.Z parameters Q2.Which parameters are used for characterizing parallel connected two port networks. A2. Y parameters.	5 min

Assignment to be given:-NIL

Reference Readings:- :- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 7

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic:-. **Y Parameters in terms of Z &ABCD Parameters & vice-versa.**	**Time Allotted:-**
1.	**Introduction**: Y parameters are short ckt parameters. They can be expressed in terms of Z& ABCD parameters by using equation of Y,Z & ABCD parameters.	5-10 min
2	**Division of the Topics** - Y & Z parameters equations -ABCD parameters equations -express Y parameters into Z& ABCD parameters using elimination method for V1,V2,I1,I2 as applicable.	25-30 min
3.	**Conclusion** Y parameters can be expressed in terms of ABCD & Z parameters by using their basics equations & process of elimination.	5 min
4	**Question / Answer** Q1.if we connect two n/w in parallel which parameters will be more useful. A1. y parameters Q2. if we connect two n/w in cascade which parameters we should use. A1. ABCD parameters .	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 8

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic:-. **Z,Y,&T Parameters in terms of h -Parameters & vice-versa.**	**Time Allotted:-**
1.	**Introduction**: Z,Y,T&h parameters are the main parameters in two port n/w.at times it becomes easier to express one parameter in terms of others parameters while working out various circuits .	5-10 min
2	**Division of the Topics** - Y & Z parameters equations -ABCD & h- parameters equations -express Y ,Z& ABCD parameters into h-parameters using elimination method for V1,V2,I1,I2 as applicable.	25-30 min
3.	**Conclusion** Y,ABCD&Z parameters can be expressed in terms of h-parameters by using their basics equations & process of elimination.	5 min
4	**Question / Answer** Q1.why there is a need to express one parameter in terns of others. A1. at times only one type of parameter is known & the ckt is such that use of other parameter will be helpful in solving the problems so there is a need to express one parameter in terms of other. .	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 9

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic:-. **Cascade interconnection of two 2- port networks.**	Time Allotted:-
1.	**Introduction**: ABCD parameters are the most simple parameters which express v1, i1, in terms of v2,i2. When the o/p of first n/w becomes the input of second n/w then it becomes cascade interconnection.	5-10 min
2	**Division of the Topics** - Interconnection of two networks is cascade. -working out overall ABCD parameters.	25-30 min
3.	**Conclusion**: When the o/p of first n/w becomes the input of second n/w then it becomes cascade interconnection.	5 min
4	**Question / Answer** Q1.if we connect two n/w in cascade which parameters are found useful. A1. ABCD parameters Q2. for cascade connection what is the overall ABCD parameters. A1. it is multiple of ABCD metrics of first with ABCD metrics of second. .	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 10

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-III

S. No.	Topic:-. **series-parallel mode interconnection of two 2- port networks**	**Time Allotted:-**
1.	**Introduction**: When the i/p sides of two n/ws are connected in series & o/p sides in parallel then it is called series-parallel mode interconnection. h parameters are found useful in solving such interconnections.	5-10 min
2	**Division of the Topics** -show using diagram series-parallel mode interconnection . workout overall . h parameters of such interconnections. -show (h)=(h1)+(h2)	25-30 min
3.	**Conclusion** . h parameters are found useful in solving two 2- port n/w interconnected in series parallel mode.	5 min
4	**Question / Answer** Q1 what do you mean by series-parallel mode interconnection of two 2- port n/w. A1. When the i/p sides of two n/ws are connected in series & o/p sides in parallel then it is called series-parallel mode interconnection. Q2 what is the overall . h parameters of such interconnections. A2. (h)=(h1)+(h2)	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 11

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-IV

S. No.	Topic :-Network topology terminology – node , branches , graph , loop , path.	Time Allotted:-
1.	**Introduction** When all the elements in a network are replaced by lines with dots at both ends the configuration is then called the graph of the network.	5-10 min
2	**Division of the Topic** -Terminology - Node - Branches - Graph - Loop - Path	25-30 min
3.	**Conclusion** By the help of proper topology any of the network can be solved easily.	5 min
4	**Question / Answer** Q1.What is degree of NODE? A1. It is a no. of branches incident to it. Q2.What is branch? A2. It is a line segment representing one network element or a combination of elements connected b/w two points.	5 min

Assignment to be given:-NIL

Reference Readings:- :- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 12

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-IV

S. No.	Topic :-Tree , Co-tree , Incidence matrix	Time Allotted:-
1.	**Introduction** Tree is the interconnected open set of branches which includes all the nodes of the graph. Co-tree is the complement of tree. Any oriented graph can be described completely in a compact matrix form i.e. incidence matrix form.	5-10 min
2	**Division of the Topic** -Tree -Co-tree -Incidence matrix	25-30 min
3.	**Conclusion** In the tree of the graph there cannot be any closed loop. Co-tree is the complement of tree Any oriented graph can be described completely in a compact matrix form i.e. incidence matrix form.	5 min
4	**Question / Answer** Q1.What is tree link or chord? A1. It is that branch of the graph that does not belong to the particular tree. Q2. Give the properties of incidence matrix? A2 i) Algebraic sum of the column entries of an incidence matrix is 0. ii) Determinant of the incidence matrix of a closed loop is 0.	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 13

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-IV

S. No.	Topic :-Reduced incidence matrix (A)	Time Allotted:-
1.	**Introduction** When one row is eliminated from the complete incidence matrix , the remaining matrix is called a reduced incidence matrix .	5 min
2	**Division of the Topic-** -Reduced incidence matrix	25-30 min
3.	**Conclusion** If the graph has b branches & (n+1) nodes , the order of the reduced incidence matrix is n * b . .	5 min
4	**Question / Answer** Q1.Define reduced incidence matrix. A1. When one row is eliminated from the complete incidence matrix , the remaining matrix is called a reduced incidence matrix. Q2.What will be the order of the reduced incidence matrix if the graph has b branches & (n+1) nodes. A2. The order of the reduced incidence matrix will be n * b .	5 min

Assignment to be given:-

Reference Reading:- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 14

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-IV

S. No.	Topic :-Fundamental cut-set & tie set matrix	Time Allotted:-
1.	**Introduction** It is the matrix that is used to find the branch currents. For a given tree of a graph , addition of each link forms a closed path.	5-10 min
2	**Division of the Topic** -Fundamental tie set matrix -Procedure of obtaining fundamental tie set matrix	25-30 min
3.	**Conclusion** So in tie set current in any branch of a graph can be found by using link currents and its directions.	5 min
4	**Question / Answer** Q.Define fundamental tie set? A. It is with respect to a tree is a loop formed by only one link associated with other twigs. Q.Define directed graph? A.A graph is said to be directed when all nodes & branches are numbered & directions are assigned to the branches by arrows.	5 min

Assignment to be given:- Define tree , co-tree , incidence matrix along with suitable examples

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 15

Semester:-III Class:-ECE -I Course Code:-EE - 203 -E

Subject:-Network Theory Unit:- IV

S. No.	Topic :-Tree branch voltages; Cut-set schedule	Time Allotted:-
1.	**Introduction** In this schedule the tree branch voltages are treated as a set of independent variables in terms of which voltage of all branches may be expressed. Tree branches connects all the nodes in the network .Hence it is always possible to trace the path from one node to another node by traveling along the tree branches only.	5 min
2	**Division of the Topic** - Tree branch voltages; Cut-set schedule - Numerical practice	25-30 min
3.	**Conclusion** It is possible to uniquely express the potential difference between any nodes (node-pair voltage) in terms of tree branch voltages.	5 min
4	**Question / Answer** Q1.Define fundamental cut-set. A1.A fundamental cut-set of a graph w.r.t a tree is a cut-set formed by one & only one twig & a set of links. Q2. Q2.The number of fundamental cut-sets is equal to the ----------. A2.Number of twigs. .	5 min

Assignment to be given:-NIL

Reference Reading:- 1) Circuit theory ----- A.Chakrabarti
2)Network Analysis ----------Umesh Shina
3)Network Synthesis ------- G.K Mithal

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Lecture Plan 16

Semester: - III Class:-ECE –I Course Code:-EE -203-E

Subject:- Network Theory Unit:-IV

S. No.	Topic :-Link Currents; Tie-Set Schedule	Time Allotted:-
1.	**Introduction** To any tree of a graph , addition of a link results in a closed path & a link current.The current in any branch of the graph then can be obtained by (i) noting the various link currents that flow through the branch & (ii) by noting the directions of the flow of these link currents through the branch**.**	5 min
2	**Division of the Topic** - Link Currents; Tie-Set Schedule - Numerical practice	25-30 min
3.	**Conclusion** It is possible to express the branch currents in terms of the link currents.	5 min
4	**Question / Answer** Q1. Define fundamental tie-set A1.A fundamental tie-set of a graph w.r.t a tree is a loop formed by only one link associated with other twigs. Q2.The number of fundamental loops is equal to the ----------. A2.Number of links.	5 min

Assignment to be given:-NIL

Reference Reading:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

Lecture Plan 17

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-II

S. No.	Topic :-Network functions-introduction, terminal pair or port , network function for one &two port network.	Time Allotted:-
1.	**Introduction** It exhibits the relationship between the transform of a source to the transform of the response for a electrical network. One port means one pairs of terminals. Two ports mean two pairs of terminals.	5-10 min
2	**Division of the Topic** -Driving pt. impedance & admittance -Transfer impedance & admittance -Transfer ratio	25-30 min
3.	**Conclusion** One port means one pairs of terminals. Two ports mean two pairs of terminals.	5 min
4	**Question / Answer** Q1.What are the restrictions in driving point functions? A1.Cofficient must be real & +ve., Complex pole zero must occur in conjugate pairs. Q2.Is Y inversely proportional to Z in case of one port network ? A2.Yes.	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 18

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-II

S. No.	Topic :-. Poles & zeros of network function	Time Allotted:-
1.	**Introduction** A network function H(s) may be written as $H(s) = A(s)/B(s) = \frac{a0(s-z1)(s-z2)\text{---------}(s-zn)}{b0(s-p1)(s-p2)\text{-------}(s-pm)}$ The complex frequencies at which the value of network function becomes zero is called Zero of the network function. The complex frequencies at which the value of network function becomes infinite is called Pole of the network function.	5-10 min
2	**Division of the Topic** -Restrictions on the location of poles & zeros on driving point function.	25-30 min
3.	**Conclusion** The complex frequencies at which the value of network function becomes zero is called Zero of the network function. The complex frequencies at which the value of network function becomes infinite is called Pole of the network function.	5 min
4	**Question / Answer** Q1.Define zero of the network function. A1. The complex frequencies at which the value of network function becomes zero is called Zero of the network function Q2.Define pole of the network function. A2. The complex frequencies at which the value of network function becomes infinite is called Pole of the network function.	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 19

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-II

S. No.	Topic :- Restrictions on the location of poles & zeros for driving point function	Time Allotted:-
1.	**Introduction** The restrictions are (i) The coefficients of the polynomials A(s) & B(s) of the network function H(s) must be positive.(ii) Poles & Zeros if complex must occur in conjugate pairs.(iii)The real part of all poles & zeros must be zero or negative.(iv)The degree of A(s) & B(s) may differ by zero or one only.	5-10 min
2	**Division of the Topic** -Restrictions on the location of poles & zeros for transfer function	25-30 min
3.	**Conclusion** The given function is not suitable for representing the driving point function if the restrictions on the location of poles & zeros for driving point function is not satisfied.	5 min
4	**Question / Answer** Q1.The degree of A(s) & B(s) may differ by ----------. A1.Zero or one only. Q2. Poles & Zeros if complex must occur in ----------. A2.Conjugate pairs.	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 20

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-II

S. No.	Topic :- Restrictions on the location of poles & zeros for transfer function	Time Allotted:-
1.	**Introduction** The restrictions are (i)The coefficients of the polynomials A(s) & B(s) are to be real.(ii)The poles & zeros if complex must occur in conjugate pairs.(iii)The real part of the poles must be negative or zero.(iv)The polynomial A(s) may have missing terms between the lowest & highest degree. Polynomial B(s) should not have any missing term. etc.	5-10 min
2	**Division of the Topic** -Restrictions on the location of poles & zeros for transfer function	25-30 min
3.	**Conclusion** The given function is not suitable for representing the transfer function if the restrictions on the location of poles & zeros for transfer function is not satisfied	5 min
4	**Question / Answer** Q1.The polynomial A(s) may have----------between lowest & highest degree terms. A1.Missing term. Q2.Degree of A(s) may be ----------of degree of B(s). A2.Zero or independent. .	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 21

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-II

S. No.	Topic :- Time-domain behaviour from pole-zero plot.	Time Allotted:-
1.	**Introduction** We can find the time domain response of a given network from the s-plane plot of the poles & zeros of the network function & from the transform of network sources. The procedure is (i) Plot the poles & zeros of the given network function on the complex s plane.(ii)Measure the distances of the given poles from each of the zeros. Also measure the distances of the same pole from each of other finite poles. (iii)Measure the angle from each of other finite poles as well as from each of other zeros.	5-10 min
2	**Division of the Topic** - Time-domain behaviour from pole-zero plot	25-30 min
3.	**Conclusion** Time domain response of a given network can be find out from the s-plane plot of the poles & zeros of the network function & from the transform of network sources.	5 min
4	**Question / Answer** Q. Time domain behaviour can be obtained from ---------- A. Pole zero plot	5 min

Assignment to be given: Q1Write the restrictions on the location of poles and zeros of the transfer function.
Q2 What do you understand by poles and zeros?

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

Lecture Plan 22

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-V

S. No.	Topic :-Introduction to filters & its basic equations	Time Allotted:-
1.	**Introduction** It is an electrical network that can transmit signals within a specified frequency range. It consist of pass band & stop band.	5-10 min
2	**Division of the Topic** -Properties of filter -Classification of filter -Active & passive filters	25-30 min
3.	**Conclusion** Practically filters do not ideally transmit the pass band signal unattenuated due to absorption, reflection or due to other loss.	5 min
4	**Question / Answer** Q.What are the properties of filter? A. Characteristics impedance, pass band characteristics, Cut off frequency characteristics. Q.What are the uses of filters? A. In voice frequency telegraphy, TV broadcasting, multichannel communication.	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 23

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-IV

S. No.	Topic :-Classification of filters	Time Allotted:-
1.	**Introduction** Filters may be classified according to the two philosophies. (i) depending upon the relationship between the arm impedances. (ii) on the basis of frequency.	5-10 min
2	**Division of the Topic** **-Classification of filters** -Low pass -High pass -Band pass -Band stop	25-30 min
3.	**Conclusion** Low pass, high pass, band pass & band stop filters are classified on the basis of frequency.	5 min
4	**Question / Answer** Q1.Give the classification of filters on the basis of frequency. A1.Low pass , High pass , Band pass & Band stop. Q2.Give the classification of filters on the basis of relation between the arm impedances. A2.(i) Prototype filters (ii) m- derived filters	5 min

Assignment to be given:-NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 24

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-V

S. No.	Topic :-Low pass filter	Time Allotted:-
1.	**Introduction** This filter attenuates all frequency above the cut off frequency & allows to pass all the frequencies below the cut off frequency. Cut –off frequency demarcates the pass band & the stop band.	5-10 min
2	**Division of the Topic** -Analysis of prototype low pass filter -Design of LPF section	25-30 min
3.	**Conclusion** In LPF shunt capacitive reactance decreases while the shunt inductive reactance increases with increase in frequency.	5 min
4	**Question / Answer** Q1.Give the bands of LPF? A1.0 – fc is pass band & fc - ∞ is attenuation band. Q2.In LPF , the shunt capacitive reactance ---------- with increase in frequency. A2.Decreases.	5 min

Assignment to be given:-NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 25

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-V

S. No.	Topic :-High pass filter	Time Allotted:-
1.	**Introduction** Simply speaking high pass filter is reverse of low pass filter. This filter attenuates all frequency below the cut off frequency & allows to pass all other frequencies above the cut off frequency.	5-10 min
2	**Division of the Topic** -Analysis of prototype high pass filter -Design of HPF section	25-30 min
3.	**Conclusion** In HPF capacitive reactance in series arm decreases while the inductive reactance in the shunt arm increases. Thus the section allows the passage of higher order frequencies blocking the lower order frequencies.	5 min
4	**Question / Answer** Q1.Give the bands of HPF? A1. fc $-\infty$ is pass band , 0 – fc is attenuation band. Q2.What are ideal filter? A2. That would transmit signals under the pass band frequencies without attenuation & completely suppress the signal with attenuation band of frequencies with a sharp cut off profile.	5 min

Assignment to be given:-NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 26

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-V

S. No.	Topic :-Band pass filter	Time Allotted:-
1.	**Introduction** It allows transmission of a limited band of frequencies & rejects all other frequencies below or above frequency band.	5-10 min
2	**Division of the Topic** -Analysis of a band pass filter -Design of band pass filter	25-30 min
3.	**Conclusion** The operation is initiated when the shunt arm as well as the series arms are in resonance. At this the shunt arm behaves as a ejector circuit offering a very high impedance in the shunt arm while the series arm at resonance offers least impedance.	5 min
4	**Question / Answer** Q.Give the bands of BPF? A. $f_2 - f_1$ is pass band, 0-f_2 & f_1-infinity is attenuation band.	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 27

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-V

S. No.	Topic :-Band reject filter	Time Allotted:-
1.	**Introduction** It is a tandem of a low pass filter with a high pass filter. Cut off frequency of high pass filter is higher than the cut off frequency of low pass filter.	5-10 min
2	**Division of the Topic** -Analysis of BRF -Design of BRF	25-30 min
3.	**Conclusion** The actions of LPF , HPF are combined into a single band stop filter.	5 min
4	**Question / Answer** Q.What are the different bands of BRF? A.0-f1,f2-infinity is pass band , f1-f2 is attenuation band	5 min

Assignment to be given:-Give the classification of filters on the basis of frequency, also design the band pass filter.

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 28

Semester:-III Class:- ECE- I Course Code EC-311-F

Subject:-Network Theory Unit:-VI

S. No.	Topic :-Hurwitz polynomials& positive real (PR) functions	Time Allotted:-
1.	**Introduction** A polynomial is said to be Hurwitz iff (i)Polynomial P(s) is real when s is real (ii) The roots of the polynomial P(s) have real parts which are to be zero or non-negative.If function F(s) = A(s)/B(s) then F(s) is positive real function iff (i) F(s) is real for s real (ii)B(s) is Hurwitz polynomial (iii) If F(s) has poles on (jω) axis ,the poles are simple (iv) Real $F(j\omega) \geq 0$ for all values of ω.	5-10 min
2	**Division of the Topic** -Hurwitz polynomials -Properties of Hurwitz polynomial -Procedure of testing of a given polynomial for Hurwitz character -Positive real functions -Properties of PR functions - Procedure of testing of PR function	25-30 min
3.	**Conclusion** In physical testing of Hurwitz polynomial (i) the coefficients of the polynomial must be positive & real (ii)no missing terms between lowest & highest degree of the polynomial. In analytical testing the quotients in the continued fraction expansion must be real & positive.Passive impedances are all PR functions. .	5 min
4	**Question / Answer** Q1.Give two properties of Hurwitz polynomial. A1.(i)Coefficient of the s terms must be positive (ii) Both the odd & even parts of the Hurwitz polynomial have roots on the imaginary axis only. Q2.The sum of PR functions is also a ---------- & the difference of two PR functions is ----------. A2.PR function , not a PR function	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 29

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-VI

S. No.	Topic :-Realization technique for a given network	Time Allotted:-
1.	**Introduction** Network synthesis refers to the operational procedure in which a PR function is given for Z(s) or Y(s) & it is required to find out the appropriate value of Z_1 & Z_2 or Y_1 & Y_2.The synthesis is complete when all the elements of the sum are known or identified.	5 -10min
2	**Division of the Topic** -Realization technique for a given network -Procedure of synthesis	25-30 min
3.	**Conclusion** The synthesis is complete when all the elements of the sum are known or identified.	5 min
4	**Question / Answer** Q.What do you understand by network synthesis? A Network synthesis refers to the operational procedure in which it is required to find out the appropriate value of circuit elements.	5 min

Assignment to be given:- Nil

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 30

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-VI

S. No.	Topic :-LC network synthesis techniques , Foster first form	Time Allotted:-
1.	**Introduction** Any LC network can be synthesized in two forms designated by the names of the inventors Foster & Cauer.In Foster synthesis there are two types of networks for realization of one port reactive network.	5-10 min
2	**Division of the Topic** -LC network synthesis techniques - Foster first form	25-30 min
3.	**Conclusion** The Foster first form of realization of LC networks is a series combination of parallel LC networks.	5 min
4	**Question / Answer** Q1.The passive element ---------- corresponds to a the pole at origin. A1.Capacitor. Q2. The passive element ---------- corresponds to a the pole at infinity. A2.Inductor.	5 min

Assignment to be given:-NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 31

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-VI

S. No.	Topic :-Foster second form , Cauer Canonic form of reactive networks	Time Allotted:-
1.	**Introduction** Foster second form is the parallel combination of series LC network .The basic form of the Cauer realization being a ladder type network. The two forms of Cauer can be realized using continued fraction expansion.	5 -10 min
2	**Division of the Topics** - Foster second form - Cauer Canonic form of reactive networks -Cauer first form -Cauer second form	25-30 min
3.	**Conclusion** Foster second form of realization is a parallel admittance realization. Cauer first form can be realized by pole-zero configuration of driving point function. In Cauer second form , the continued fraction expansion is to be performed with the numerator & denominator .	5 min
4	**Question / Answer** Q1.The passive element ---------- corresponds to a the pole at origin in Foster second form. A1.Inductor Q2. The passive element ---------- corresponds to a the pole at infinity in Foster second form. A2.Capacitor	5 min

Assignment to be given:-NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 32

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-VI

S. No.	Topic :-Cauer Canonic form –second form (contd)	Time Allotted:-
1.	**Introduction** The basic form of the Cauer realization being a ladder type network. The two forms of Cauer can be realized using continued fraction expansion.	5 -10 min
2	**Division of the Topics** - Cauer first form revision -Cauer second form Contd. Fraction expansion method using num.& denominator.	25-30 min
3.	**Conclusion** Cauer first form can be realized by pole-zero configuration of driving point function. In Cauer second form , the continued fraction expansion is to be performed with the numerator & denominator .	5 min
4	**Question / Answer** Q1.how cauer II is different from cauer I in synthesizing the given transfer function in to n/w. A1. Cauer II is realized using continued fraction expansion method using numerator & denominator	5 min

Assignment to be given:-NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

Lecture Plan 33

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:- I

S. No.	Topic :-laplace transform of basic ckt elements R, L& C .	Time Allotted:-
1.	**Introduction** laplace transform i s one of the most versatile mathematical tool in solving ckts involving elements R,L &C. it eliminates the use of differentials & integrals.	5 -10 min
2	**Division of the Topics** - laplace transform - laplace transform of basic function like step , ramp, impulse & sinusoidal signals - laplace transform of differentials & integrals. - . laplace transform of R ,L &C. - initial & final value theorems - inverse laplace transformation	25-30 min 5 min
3.	**Conclusion** laplace transform i s one of the most versatile mathematical tool in solving ckts involving elements R,L &C. it eliminates the use of differentials & integrals. It is very helpful in analysing transient behaviour of ckts.	5 min
4	**Question / Answer** Q1. what is the laplace transform of unit impluse function A1. I Q2. Express L &C In Laplace Transform. A2. L as LS & C as 1/CS	

Assignment to be given:-NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

Lecture Plan 34

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:- I

S. No.	Topic :-Introduction to transient response	Time Allotted:-
1.	**Introduction** In a network containing energy stored elements with change in excitation , the current & the votage changes from one state to another state .The behaviour of voltage on current when it is changed from one state to anothet state is called transient response.	5 -10 min
2	**Division of the Topics** - Introduction to transient response - Different dc inputs i) step input ii) ramp input iii) impulse input	25-30 min
3.	**Conclusion** The transient analysis deals with passive electric circuits using initial conditions & differential equation approach.	5 min
4	**Question / Answer** **Q1.**Define steady state. A1.A circuit having a constant source is said to be in steady state if the current & the voltage donot change with time. Q2.Transient behaviour occurs in ---------- A2.Inductive & capacitive circuits.	5 min

Assignment to be given:- NIL

Reference Readings: 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

Lecture Plan 35

Semester:-III Class:-ECE I Course Code EC-311-F

Subject:-Network Theory Unit:- I

S. No.	Topic :-Transient response of series RC circuit having dc excitation	Time Allotted:-
1.	**Introduction** With the application of voltage assuming no initial conditions across the capacitor the capacitor will not produce any voltage across it.	5-10 min
2	**Division of the Topics** -Transient response of series RC circuit having dc excitation -Profile of current in RC charging circuit -Profile of v_R & v_C in RC charging circuit -Discharging in RC series circuit	25-30 min
3.	**Conclusion** The voltage across the capacitor will start discharging current through the resistors in opposite to the original current direction.	5 min
4	**Question / Answer** Q1.A capacitor does not allow sudden changes in ---------- A1.Current. Q2.The time constant of series RC circuit is ---------- A2.1/RC	5 min

Assignment to be given:-
Calculate the time taken by capacitor of 1μF & in series with a 1Mohm resistance to be charged upto 80% of final value.

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 36

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-I

S. No.	Topic:-. **Transient response of series RL circuit having dc excitation**	**Time Allotted:-**
1.	**Introduction**: The time constant is defined as the ratio of L & R in L-R circuit (R-L is the inverse of time constant & is called damping ratio.	5-10 min
2	**Division of the Topics** - Transient response of series RL circuit having dc excitation -Profile of current in RL charging circuit -Profile of v_R & v_L in RL charging circuit -Discharging in RL series circuit	25-30 min
3.	**Conclusion** The voltage transient across the resistor is an exponential rise while that across the inductor is an exponential decaying.	5 min
4	**Question / Answer** Q1.A inductor does not allow sudden changes in ---------- A1.Voltage. Q2.The time constant of series RL circuit is ---------- A2.L/R.	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 37

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:-I

S. No.	Topic:-. **Transient response of RL&RC circuits to sinusoidal signal**	**Time Allotted:-**
1.	**Introduction**: RL & RC CKTS behave in a unique way to sinusoidal signal . the sinusoidal signal taken in a general for sin (wt+0) .	5-10 min
2	**Division of the Topics** Write time domain equation of RL & RC ckts with i/p as sin (wt+0) Take laplace of equation Making of partial fraction Taking of inverse laplace Show result as sum of PI&CF	25-30 min
3.	**Conclusion** RL & RC CKTS behave in a unique way to sinusoidal signal . The sinusoidal signal taken in a general form is sin (wt+0) & behaviour analyzed using laplace transform	5 min
4	**Question / Answer** Q1.when the i/p is sin (wt+0) to RL & RC ckts which will be the transient term. A1.complementry function will show the transient behaviour..	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal

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Lecture Plan 38

Semester:-III Class III ECS I Course Code EC-311-F

Subject:-Network Theory Unit:- I

S. No.	Topic:-. **Transient response of RLC circuits to various signals.**	Time Allotted:-
1.	**Introduction**: Very often the ckt contain all the basic elements R, L & C . it is important to study & analyze the behavior of series RLC ckt to various types of i/p signals such as step , ramp & impulse function.	5-10 min
2	**Division of the Topics** Write time domain equation of RL &C ckts with i/p as v(t) Take laplace of equation with v(s) as step, ramp ,& impulse at one time. Making of partial fraction Taking of inverse laplace	25-30 min
3.	**Conclusion** With laplace transform of we can easily analyse behavior of RLC series ckt to various type of i/p signals such as step, ramp & impulse.	5 min
4	**Question / Answer** Q1.what is laplace of unit step, unit ramp. A1. unit step= 1/s & unit ramp = 1/s2	5 min

Assignment to be given:- NIL

Reference Readings:- 1) Circuit theory ----- A.Chakrabarti
2) Network Analysis ----------Umesh Shina
3) Network Synthesis ------- G.K Mithal