UE – 117

IV Semester B.E. (E and C) Degree Examination, June/July 2011
(Y2K6 Scheme)
EC 404 : NETWORKS AND LINES

Time : 3 Hours Max. Marks : 100

Instruction : *1) Answer **any five** full questions, choosing atleast **two** from **each** Part.*

*2) Write the sketches **neatly**.*

PART – A

1. a) Define and explain image and iterative impedance of an asymmetrical N/W. **20**

   b) Obtain an expression for the image and iterative impedances of an asymmetrical T-network.

2. a) S.T. the attenuation and phase constant of an open wire line at high frequency is approximately given by $\alpha = \frac{1}{2}\left[R\sqrt{\frac{C}{L}} + G\sqrt{\frac{L}{C}}\right]$ **10**

   b) An open wire telephone line has R = 10Ω/km, G = 0.4 x 10^{-6} ʊ/km, L = 0.0037 Fumy/km, C = 0.0083 x 10^{-6} farad/km. Determine Z_0, α, β at 5 Khz. **10**

3. a) What is an equalizer? Describe typical attenuation and phase equalizers. Discuss their application in line communication. **10**

   b) Derive Campbell's equation. What is its significance ? **10**

4. Write notes on : **(10x2=20**

   a) Line constants

   b) Distortions in Transmission line.

PART – B

5. a) Define SWR and Reflection co-efficient. Deduce the relationship between them. **10**

   b) The terminating load of a transmission line (Z_0 = 5Ω's) marking at 300 Mhz is (50 + j50)Ω. Calculate VSWR and reflection Co-efficient. **10**

P.T.O.

6. a) Clearly explain stub matching. Discuss the advantages and disadvantages of single stub matching and double stub matching. **10**

   b) A 200 + j75 Ω load is to be matched to a 300Ω line to give SWR = 1. Calculate the reactance of the stub and Z_0 of $\lambda/4$ transformer, both connected to the load. **10**

7. a) What is a smith chart ? Why must impedances be normalized before being plotted on a standard Smith chart ? What are its applications ? **10**

   b) A load $Z_L = 100 - j50\Omega$ is connected to a line whose $Z_0 = 75\ \Omega$. Calculate using Smith chart.

   i) The pt. nearest to the load at which $\lambda/4$ transformer be inserted to provide correct matching.

   ii) Z_0 if transmission line to be used for the transformer. **10**

8. Write notes on : **(5x4=20)**

   a) Impedance matching

   b) Lorses in RF transmission lines

   c) Normalised impedance

   d) Effects of frequency variation in stub.

IV Semester B.E. (E & C) Degree Examination, June/July 2017
(Y2K6 Scheme)
EC 404 : NETWORKS AND LINES

Time : 3 Hours Max. Marks : 100

Instruction : *1) Answer* ***any five*** *full questions, choosing atleast* ***two*** *from* ***each*** *Part.*
2) Write the sketches ***neatly.***

PART – A

1. a) Define image impedance, iterative impedance and characteristic impedance of a two-port network. **10**

   b) A T-network is formed with series and shunt arm impedances Z_1 and Z_2 (series) and Z_3 (shunt). Determine the iterative and image impedances if $Z_1 = 30 + j\,7.5\ \Omega$, $Z_2 = 50 + j10$ and $Z_3 = -j\,3.229\ \Omega$'s. **4**

2. a) What is attenuator? Derive the design equations of T-type attenuator. **6**

   b) It is desired to design a T-type attenuator pad with 40 dB loss to work between a source impedance of 70Ω's and a load impedance of 600 Ω's. Determine the resistance value of the elements of the pad. **8**

3. a) Starting from 1st principles, S.T. $Z_0 = \sqrt{\frac{Z}{Y}}$ and $\lambda = \sqrt{ZY}$ where Z_0 is the characteristic impedance, λ = propagation constant, Z is the series impedance per unit length and Y is the shunt admittance per unit length. **10**

   b) A transmission line of 10 km long has Z_0 =600Ω and α = 0.1 neper/km and β = 0.5 radians per km. Find the received current and voltage when 20m. amps are sent down to one end and the receiving end is shorted. **10**

4. a) Explain different types of distortions encountered in transmission line. **10**

   b) A U.G. cable with constants R = 44Ω's/km, G = 1 μ℧/km, L =0.001 henry/km and C =0.005 μt/km is loaded with 88 mH coils of resistance 3.7 Ω's at 1.136 km spacing. Find the approximate value of Z0, α and β if the frequency is 1000 hz. **10**

PART – B

5. a) Explain the terms reflection co-efficient, reflection loss and SWR. Deduce the relationship between SWR and reflection co-efficient. **10**

b) Derive the i/p impedance of a $\lambda/4$ line and explain how it can be used as impedance matching device ? **10**

6. a) Derive the expression for Z in of a transmission line terminated in Z_R. **10**

b) The Z_0 of a certain line is $10 \underline{|14^{\circ}}$ Ω and P = 0.007 + j0.028 /km. The line is terminated by 300 Ω's. Determine Z in of the line if its length is 100 km. **10**

7. a) Give a neat sketch of a smith chart and explain clearly step by step procedure of determining the length and location of a short ckt stub line. **10**

b) A low loss line with Z_0 = 70 Ω's is terminated by Z_R = 115 – j 80Ω's. If λ = 2.5 m, determine

i) SWR

ii) Min. and Max. line impedance

iii) Distance between the load and first voltage minima using Smith Chart. **10**

8. a) Explain the theory of single stub matching and derive expression for the length and location of stub. **10**

b) A UHF transmission line working at 1 Ghz ia connected to an unmatched line producing a voltage reflection co-efficient of $0.5 \underline{|30^{\circ}}$. Calculate the length and position of the stub to match the line. **10**

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IV Semester B.E. (E&C) Degree Examination, June/July 2013
(Y2K6 Scheme)
EC-404 : NETWORKS AND LINES

Time : 3 Hours Max. Marks : 100

Instruction : *Answer* ***any five*** *full questions, choosing atleast* ***two*** *from* ***each*** *Part.*

PART – A

1. a) Explain the following parameters with respect to networks : **9**
   i) Characteristic impedance
   ii) Propagation constant
   iii) Image impedance.

   b) Derive the characteristic impedance and propagation constant of symmetrical T-Networks. **11**

2. a) Design a symmetrical T-attenuator to give an attenuation of 20 dB and to work in line of 600 Ω impedance. Derive the necessary formulas used. **10**

   b) What is equalizers ? Mention its applications. **5**

   c) Write a note on Inverse network. **5**

3. a) Design a prototype high pass filter has a cut off frequency of 10 KHz and normal impedance of 600 Ω . Derive the necessary formulas used. **10**

   b) Derive an expression for the characteristic impedance, attenuation constant and phase constant of a Transmission line in terms of primary constants. **10**

4. a) The characteristic impedance of a certain line is 710 $\angle -16^\circ$ Ω when the frequency is 1 KHz. At this frequency the attenuation is 0.01 nepers/kms and the phase constant is 0.035 rad/kms. Calculate R, L, C, G and velocity of propagation. **10**

   b) Derive Compbell's equation for a loading line. **10**

PART – B

5. a) What is reflection coefficient and derive the expression of reflection coefficient in terms of Z_R and Z_O ? **8**

   b) An open-wire line made of copper conductors each having a diameter of 3 mm and spaced 3 cm apart is terminated in an impedance of (100 – j 100)Ω and operated at 8 MHz. Calculate K and S. **6**

   c) Write a note on quarter wave section as an impedance transformer. **6**

6. a) What is Smith chart ? Explain its properties. **10**

   b) A 50Ω air filled co-axial line is terminated with a complex load impedance of (80 – j60)Ω . Design a double stub matching system using short circuited co-axial lines of characteristic impedance 50Ω each. Assume spacing between stubs equal to 3λ / 8 at a frequency of 500 MHz. Use Smith chart. **10**

7. a) Explain the steps involved in the design of single stub matching using Smith chart. **10**

   b) A load of Z_R = 115 – j75Ω terminates a lossless 100Ω line. Use Smith chart to determine

      i) Standing wave ratio

      ii) Input impedance of a 0.2λ long line and

      iii) The distance from load to the first voltage maximum. **8**

8. a) What are the advantages and disadvantages of a optical fiber over copper wires ? **8**

   b) Write a note on : **12**

      i) Losses in fibres

      ii) Connectors

      iii) Splicers.

IV Semester B.E. (Electronics & Commn.) Degree Examination, June/July 2014
(Y2K6 Scheme)
EC - 404 : NETWORKS AND LINES

Time : 3 Hours Max. Marks : 100

Instruction : *Answer **any five** full questions, choosing atleast **two** from **each** Part.*

PART – A

1. a) Obtain the characteristic impedance, propagation constant, open and short circuit impedance for an symmetrical π -network. **10**
   b) Mention symmetrical and asymmetrical network parameters. **4**
   c) Find the characteristic impedance of a symmetrical T section whose total series arm impedance is (50 + j125)Ω and shunt arm impedance is (200-j100) ohms. **6**

2. a) Design symmetrical Lattice attenuator. **6**
   b) Develop the design equations for series and shunt equalizers. **8**
   c) The series arm of lattice equalizer used with a telephone cable line of 600 ohms characteristic impedance consists of aresitance of 400 Ω and an inductance of 40 mH in series. Find the other arm of lattice. **6**

3. a) Derive the expressions for the voltage nd current at any point along a uniform transmission line. **12**
   b) A generator of 1.0 volt, f = 1000 hz, supplies power to a 160kM open-wire line terminated in Z_0 and having the following parameters.
      R = 6.5Ω/km, L = 2.294 mH/km
      G = 0.5μ ℧ /km, C = 5.219 nf/km
      Find $Z_{0,}$ γ, V_p, λ, sending end current and load current. **8**

4. a) Obtain the expression for the cut-off frequency of a prototype high pass filter. Design a constant -k- high pass filter with R_0 = 600Ω and f_c = 600Hz. **8**
   b) State and explain Compbell's equation for the loading cables. **4**

P.T.O.

c) Show that a line will be distortionless if LG = RC.

In a certain distortionless line the values of R and G were given to be 6 Ω/km and 3.2μ ℧/km respectively. If the phase velocity of a wave travelling through this line was found to be 2×10^5 km/s.

a) attenuation constant

b) inductance L

c) capacitance C of the line.

8

PART – B

5. a) Show that the input impedance of dissipation less RF transmission line with open or short-circuited terminations are pure reactance. Sketch their reactance curves. **8**

b) Find the reflection coefficient and voltage standing wave ratio of a line having $R_0 = 100\Omega$ and Z_R (load –impedance) is (100 – j 100) Ω. **4**

c) Explain the Quarter-wave line by deducing the characteristic impedance. Mention Quarter-wave line applications and explain any one of it. **8**

6. a) Explain the construction of constant resistance and constant reactance circle In Smith chart. **8**

b) Mention the applications of Smith chart. **4**

c) The terminating load of a transmission line of $Z_0 = 50\underline{|0^\circ}$ Ω working at 300 MHz is 50 + j50 Ω . Calculate VSWR and position of first V_{min} using Smith chart. **8**

7. a) Derive expressions for location and length of a short circuited stub for single stub matching. **10**

b) A line of characteristic resistance equal to 300Ω is connected to a load of 73Ω resistance. For a frequency of 45 MHz, the line is to be matched using double stub. Design double stub matching using Quarter-wave spacing between the two stubs. **10**

8. Write a short note on the following : **(4x5=20)**

i) standing wave ratio

ii) losses in optical fibres

iii) reflection loss and reflection factor

iv) composite filters.

IV Semester B.E. (E & C) Degree Examination, June/July 2015
(Y2K6 Scheme)
EC – 404 : NETWORKS AND LINES

Time : 3 Hours | Max. Marks : 100

Instructions : *Answer **any five** full questions, choosing atleast **two** full questions from **each** Part.*

PART – A

1. a) Derive the expressions for propagation constant and characteristic impedance for symmetrical 'T' network. **7**

   b) Derive the design equation for symmetrical 'π' network in terms of open circuit and short-circuit impedances. **8**

   c) A lattice network has series impedances of 400 Ω each and shunt impedance of 900 Ω each. Find its characteristic impedance and propagation constant. **5**

2. a) Derive the design equation for symmetrical 'T' attenuator. **7**

   b) Design symmetrical 'T' attenuator to operate between 75 Ω and provide 20 dB attenuation. **5**

   c) What are equalizers ? Mention their application. **8**

3. a) Design a full series equalizer to provide 15 dB attenuation at 100 Hz and 2 dB at 200 Hz in a circuit of 600 Ω impedance. **5**

   b) Derive the design equation for a prototype constant k 'T' section low pass filter. **10**

   c) Find the elements of prototype low pass 'T' section filter of constant k type having a cutoff frequency of 8 KHz with a design impedance of 600 Ω. **5**

4. a) Derive the differential equations of uniform transmission lines. **10**

   b) A transmission line has the following per km parameter at 5 KHz, R = 10 Ω, G = 0.4×10^{-6} ℧, L = 0.0037 mH, C = 0.0083×10^{-6} Farad. Find Z_0, α and β. **10**

PART – B

5. a) Derive the condition for distortion less transmission line. **10**

b) What is standing wave ratio ? Obtain relationship between V_{SWR} and reflection coefficient K. **10**

6. a) What is stub matching ? Explain the steps involved in the design of single stub matching using Smith chart. **10**

b) A low loss line with $Z_0 = 70\ \Omega$ is terminated by $Z_R = 115 - j80\,\Omega$. If $\lambda = 2.5$ m find

i) SWR

ii) Minimum and maximum line impedance

iii) Distance between the load an first voltage minima using Smith chart. **10**

7. a) What is a Smith chart ? Explain the properties of Smith chart. **10**

b) If Z_0 of a line is $10\underline{|14°}\,\Omega$ and P = 0.007 + j 0.028/km and it is terminated by 300 Ω find Z_{in} of the line if its length is 100 km. **10**

8. Write short notes on : **(5×4=20)**

a) Connectors and splicers

b) Composite filters

c) Image impedance

d) Step index and graded index cables.

UJ – 128

IV Semester B.E. (E & C) Degree Examination, June/July 2016
(2K6 Scheme)
EC404 – NETWORKS AND LINES

Time : 3 Hours Max. Marks : 100

Instruction : *Answer* ***any five full*** *questions, choosing atleast* ***two full*** *questions from* ***each*** *Part.*

PART – A

1. a) Derive the design equation for symmetrical 'π' network in terms of open circuit and short circuit impedances. **10**

   b) A lattice network has series impedances of 300 Ω each and shunt impedance of 500 Ω each. Find its characteristic impedance and propagation constant. **5**

   c) Explain the conversion of T to π network with relevant equations. **5**

2. a) Explain the need for an equalizer in a transmission line. **5**

   b) Derive the design equation for symmetrical 'T' attenuator. **10**

   c) Design a full-series equalizer to provide 10 dB attenuation at 200 Hz and 2 dB at 400 Hz in a circuit of 300 Ω impedance. **5**

3. a) Derive the design equation for a prototype constant K 'T' section low pass filter. **10**

   b) Find the elements of prototype high pass 'T' section filter of constant K type having a cut-off frequency of 6 KHz with a design impedance of 400 Ω . **10**

4. a) The characteristic impedance of a transmission line is 100 Ω and the load impedance is 200 Ω . Calculate

   a) Voltage-reflection-coefficient

   b) VSWR

   c) Reflected power in percent if Vi is 90 volts. **10**

   b) Derive the differential equation of uniform transmission line. **10**

PART – B

5. a) Define reflection coefficient. Derive the equation for reflection coefficient at the load end and at a distance 'd' from load end. **10**

b) Derive the condition for distortion less transmission line. **10**

6. a) What is stub matching and describe in detail the design of single stub matching using Smith-chart. **10**

b) A transmission line with a characteristic impedance $(50 + jo)\ \Omega$ is terminated in an impedance $(25 - j100)\ \Omega$.

Determine the reflection co-efficient at the terminal load end of the line using Smith-chart. **10**

7. a) What is a Smith chart ? Explain the properties of Smith-chart. **10**

b) Determine the load-impedance Z_l and the standing wave ratio ρ given that low-loss line has a characteristic impedance Z_o of $500\ \Omega$ and that the reflection co-efficient $\Gamma = 0.4 \angle -50^\circ$. **10**

8. a) What are the advantages of an optical fiber over copper cables. **8**

b) Define the following terms :

i) Total internal reflection

ii) Critical angle

iii) Acceptance angle

iv) Numerical aperture **6**

c) Briefly discuss the types of losses in an optical fiber. **6**

UJ – 130

IV Semester B.E. (E&C) Degree Examination, June/July 2017
(Y2K6 Scheme)
EC 404 : NETWORKS AND LINES

Time : 3 Hours Max. Marks : 100

Instruction : *1) Answer* ***any five*** *full questions, choosing atleast* ***two*** *from* ***each*** *Part.*
2) Write the sketches ***neatly.***

PART – A

1. a) Define image impedance, iterative impedance and characteristic impedance of a two-port network. **10**

b) A T-network is formed with series and shunt arm impedances Z_1 and Z_2 (series) and Z_3 (shunt). Determine the iterative and image impedances if $Z_1 = 30 + j\,7.5\ \Omega$, $Z_2 = 50 + j10$ and $Z_3 = -j\,3.229$. **4**

2. a) What is attenuator? Derive the design equations of T-type attenuator. **6**

b) It is desired to design a T-type attenuator pad with 40 dB loss to work between a source impedance of 70Ω's and a load impedance of 600 Ω's. Determine the resistance value of the elements of the pad. **8**

3. a) Starting from 1st principles, S.T. $Z_0 = \sqrt{\frac{Z}{Y}}$ and $\lambda = \sqrt{ZY}$ where Z_0 is the characteristic impedance, λ = propagation constant, Z is the series impedance per unit length and Y is the shunt admittance per unit length. **10**

b) A transmission line of 10 km long has Z_0 =600Ω's and α = 0.1 neper/km and β = 0.05 radians per km. Find the received current and voltage when 20m amps are sent down to one end and the receiving end is shorted. **10**

4. a) Explain different types of distortions encountered in transmission line. **10**

b) A UG cable with constants R = 44Ω's/km, G = 1 μ℧/km, L =0.001 henry/km and C =0.005 μt/km is loaded with 88 mH coils of resistance 3.7 Ω's at 1.136 km spacing. Find the approximate value of Z0, α and β if the frequency is 1000 hz. **10**

P.T.O.

PART – B

5. a) Explain the terms reflection co-efficient, reflection loss and SWR. Deduce the relationship between SWR and reflection co-efficient. **10**

b) Derive the i/p impedance of quarter wave line and explain how it can be used as impedance matching device ? **10**

6. a) Derive the expression for Z in of a transmission line terminated in Z_R. **10**

b) The Z_0 of a certain line is $10 \underline{|14^\circ}$ Ω and P = 0.007 + j0.028 /km. The line is terminated by 300 Ω's. Determine Z in of the line if its length is 100 km. **10**

7. a) Give a neat sketch of a Smith chart and explain clearly step-by-step procedure of determining the length and location of a short cktd, stub line. **10**

b) A low loss line with Z_0 = 70 Ω's is terminated by Z_R = 115 – j 80Ω's. If λ = 2.5 m, determine

i) SWR

ii) Min. and Max. line impedance

iii) Distance between the load and first voltage minima using Smith Chart. **10**

8. a) Explain the theory of single stub matching and derive expression for the length and location of stub. **10**

b) A UHF transmission line working at 1 Ghz ia connected to an unmatched line producing a voltage reflection co-efficient of $0.5 \underline{|30^\circ}$. Calculate the length and position of the stub to match the line. **10**
