VINAYAKA MISSIONS UNIVERSITY

VMKV ENGINEERING COLLEGE, SALEM

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

TRANSMISSION LINES AND WAVE GUIDES
(COMMON TO ECE & ETCE)

PROGRAM/ BRANCH: BE / ECE YEAR/ SEM : III/ V

QUESTION BANK

UNIT I
PART A

1. Define neper & bel.
2. Define decibel.
3. What is filter?
4. What are the types of filter?
5. What is symmetrical networks?
6. Write the equivalent value of neper to decibel?
7. What are the parameter of filter?
8. How will you construct band pass filter by using LPF & HPF?
9. How will you construct band stop filter by using LPF & HPF?
10. What is cut off frequencies?
11. Define characteristics impedance.
12. What is propagation constant?
13. What is constant k low pass filter?
14. What are the types of constant k filter?
15. What is low pass filter?
16. Write a short notes on m derived filter?
17. What are the disadvantage of constant k filter?
18. Draw the diagram of symmetrical T-network of LPF?
19. Draw the circuit diagram of band elimination filter of m derived filter?
20. What is crystal filter?
21. Design a ladder network formed by symmetrical T-network?
22. Write a relationship between propagation constant in terms of Zo.
23. Define composite filter.
24. Draw the general configuration of constant k LPF?
25. Draw the variation of attenuation α & β with frequency in constant k LPF & HPF?

PART B

1. Explain the characteristics impedance of symmetrical network.

2. Develop the differential equations governing the voltage and current at any point on a uniform transmission line, and then solve these to obtain the voltage and current in terms of the load current and voltage.

3. Design a low pass filter (both T & Π) having cut off frequency 1 KHZ to
   i) Operate with a terminated load resistance of 200□
   ii) Find the frequency at which this filter offers attenuation of 19.1 db.

4. Explain about filter fundamentals.
5. Explain about behavior of the characteristics impedance.
6. What is constant k filter? & derive the expressions for LPF.
7. i) Design a constant k BPF with fc of 3khz & 7.5 khz & nominal characteristics impedance or Ro=900□
   ii) design a constant BSF with fc of 3khz & 7.5 khz & nominal characteristics impedance or Ro=900□

8. Explain about m derived filter of T & Π sections.
9. Explain about filter performance.
10. What is crystal filter & explain it.

UNIT II
PART A

1. What is transmission line?
2. What are the types of transmission lines?
3. What are the parameters of transmission lines?
4. Define Propagation constant.
5. What is a finite line? Write down the significance of this line?
6. Give the properties of infinite lines.
7. What are the types of line distortions?
8. How to avoid the frequency distortion that occurs in the line?
9. What is a distortion less line? What is the condition for a distortion less line?
10. What is the drawback of using ordinary telephone cables?
11. What is loading?
12. Define reflection coefficient.
13. What is a smooth line?
14. List the parameters of a transmission line
15. State the conditions for a distortion less line.
16. What are the disadvantages of parallel open wire line?
17. What is the principle of reflection phenomenon?
18. Define wave length.
19. Define velocity.
20. Why is waveform distorted in transmission line?
21. A transmission line with a characteristic resistance of 50 ohm is connected to a 100-ohm resistance load. Calculate the voltage reflection coefficient at the load.

22. Mention the characteristics of an infinite line.
23. What are the practical considerations of underground cable?
24. Discuss briefly about loading in Telephone cable.
25. What is return loss?

PART B

1. i) Explain physical significance of a general solution of transmission line.(6)
   ii) Describe the expression of a line not terminated in Z_0. (6)
2. A generator of 1 V, 1 KHz supplies power to a 100 km open wire line terminated in 200 Ω resistance. The line parameters are R = 10 Ω/ Km, L = 3.8 mH / Km, G = 1 x 10^{-6} mho/ Km, C = 0.0085 uF/ Km. Calculate the input impedance, reflection coefficient and sending end current.
3. Derive the general solution of transmission lines.
4. i) Show that a line will be distortion less if CR = LG. (6)
   ii) A transmission line has the following per unit length parameters R = 52 Ohm/m, L = 0.1 uH / m, C = 300 pF / m, G = 0.01 mho/m(6) Calculate the propagation constant and characteristics impedance of transmission line at 500 MHz; obtain the same parameters for loss less line.
5. Derive the expression for the insertion loss of transmission line.(5)
   ii) A transmission line has Z_0 =700∠-13.4° ohm is inserted between a generator of 200 ohm and a load of 400 ohm. The attenuation and phase constant of the line is α = 0.00712 neper / Km and β = 0.0288 rad / Km. Calculate the insertion loss if the length is 200 Km. (7)
6. What is distortion line? Explain its types.
7. A transmission line of 2 miles long operates at 10 kHz and has parameters R=30 Ω/mile, L=2.2mH/mile, C=80nF/mile and G=20nV/mile. Find the characteristic impedance, propagation constant, attenuation and phase shift per mile.
8. i) Explain a line of cascaded T sections
   ii) Reflection on a line is not terminated in Zo.
9. Give expressions for open & short circuited lines.
10. Explain about telephone cable

UNIT III

PART A

1. State the assumptions for the analysis of the performance of the radio frequency line.
2. What are nodes and antinodes on a line?
3. What is standing wave?
4. What is the range of values of standing wave ratio?
5. What is called standing wave ratio?
6. Give the input impedance of dissipationless line.
7. What is the application of the quarter wave matching section?
8. Explain impedance matching using stub.
9. Give the formula to calculate the length of the short circuited stub.
10. List the applications of the smith chart.

11. Write a note on smith chart.
12. What are the difficulties in single stub matching?
13. Give reason for an open line not frequently employed for impedance matching.
14. Why Double stub matching is preferred over single stub matching?
15. A 50 ohm line is terminated in load Z_R (90+j60). Determine VSWR due to this load.
16. Derive the expression for the voltage at a point S away from the receiving end interms of reflection coefficient.
17. A line with characteristic impedance of $692\angle-12°$ is terminated with 200 ohm resister. Determine K.
18. Write a note on quarter wave line.
19. A certain transmission line, working at ratio frequencies, has following constants L=9μH/m, C-16pf/m. the line is terminated in a resistive load of 1000□. Find the reflection coefficient and standing wave ratio.
20. What is dissipation less line.
21. Calculate the standing wave ratio and reflection co efficient on a line having Zo=300□ and terminated in ZR=300 + j 400.
22. What is resonant lines.
23. Write the properties of smith chart.
24. What is a application of half wave line.
25. What is zero dissipation line?

PART B

1. Discuss how a smith chart is constructed and explain its applications.
2. Explain the following:
   i) Single stub matching. (8)
   ii) Double stub matching.(4)
3. Derive the expression of circle diagram for the transmission line.
4. Explain about voltage & current on a dissipation less line.
5. What is standing wave ratio & give relation between SWR (S) & magnitude of reflection coefficient (K).
6. A dipole antenna whose input impedance is 100 ohm is to be matched at frequency of 100 MHz to a transmission lines having Z_o of 600 ohm by means of short circuit stub. Determine the location and length of the stub.
7. Determine the SWR, characteristic impedance of the quarter wave transformer, and the distance the transformer must be placed from the load to match a75 ohm , transmission line to load Z_L=25-j50 ohm.
8. Determine the input impedance of open and short circuited dissipationless transmission line.
9. Explain about one eighth wave line and quarter wave line.
10. Define and explain the following
    i) Standing waves (4)
    ii) Standing wave ratio(4)
    iii) Relation between SWR and 'K'.(4)

UNIT IV

PART A

1. What are guided waves? Give examples.
2. What is cut off frequency?
3. Write down the expression for cut off frequency when the wave is propagated in between two parallel plates.
4. Give the expressions for the guide wavelength when the wave is transmitted in between two parallel plates.
5. Mention the characteristics of TEM waves.
6. Define attenuation factor.
7. What is dominant mode? Give examples.
8. What is TE wave?
9. What is TM wave?
10. Give the relation between the attenuation factor for TE waves and TM waves
11. Why are rectangular wave-guides preferred over circular wave-guides?
12. Mention the applications of wave guides.
13. What is a TEM wave or principal wave?
14. What is TM wave or E wave?
15. What is the boundary conditions of TEmn wave in rectangular wave guide?
16. Distinguish TE wave and TM wave?
17. Give the dominant mode for TE and TM waves
18. Mention the characteristics of TEM waves.
19. What is attenuation constant in range of propagation?
20. Define characteristic impedance in a waveguide.
21. Draw the neat sketch showing the variation in the value of attenuation with frequency for TE,TM,TEM mode between parallel plates.
22. Find the frequency of minimum attenuation for TM mode.
23. Define group velocity and phase velocity
24. For a frequency of 6000 MHz and plane separation of 7 cm, find critical wavelength.
25. What is attenuation for TEM wave.

PART B

1. Derive the electromagnetic field expressions for waves guided by a parallel conducting plane?
2. (i) Bring out the differences between TE,TM and TEM waves.(9)
   (ii) Find the cut-off frequency for the TE_1 mode for the frequency of 8000 MHz and plane separated by10 cm.(7)
3. Define wave impedance. Obtain the expression for wave impedance of TE, TM and TEM waves in two parallel conducting planes.
4. Explain about the velocity propagation of guided waves..
5. Derive the expressions for the field components of TM waves in a parallel plane waveguide.
6. i) what are the properties of TEM waves

ii) a pair of perfectly conducting planes are separated 4 cm in air. For a frequency of 5000 MHZ with TM1 mode find following,

a) cut off frequency b) cut off wavelength c) phase constant.

7. For the frequency of 6000 MHz and plane separation of 7 cm, find the following for TE_1 mode.
   i) Critical frequency (3)
   ii) Phase constant (3)
   iii) Attenuation constant(3)
   iv) Critical wavelength.(3)
8. i) Write different characteristics of TE and TM waves.
   iii) Attenuation in parallel plane guides
9. i) what is TE & TM waves
   ii) A parallel plane wave guide consists of two sheets of good conductor separated by 10cm. find the propagation constant at frequencies of 100 MHz and 10MHZ when the guide is operated in TE10 mode. Does the propagation take place in each area.
10. i) what is TEM waves?
    ii) characteristics of TE& TM waves.

UNIT V

PART A

1. What are waveguide?
2. What consists of wave guide?
3. Draw the field distribution in TM wave in rectangular wave guide.
4. Write the boundary condition for the rectangular waveguide in rectangular co ordinate system (TM wave).
5. What is boundary condition of TE mn wave in rectangular wave guide?
6. What is meant by dominant mode of the wave?
7. State the reason of impossibilities of TEM wave in wave guide.
8. Write the assumptions to be taken for analysis of rectangular wave guide in TE & TM modes?
9. What are the boundary conditions for the TE wave?
10. Which are non zero field components for the TE10 mode in a rectangular wave guide?
11. Which are non zero field components for the TM11 mode in a rectangular wave guide?
12. How the modes of the transverse electric and magnetic waves are represented?
13. What is the cut off wavelength & cut off frequency of the TE10 mode in a rectangular wave guide?
14. What is the cut off wavelength & cut off frequency of the TM11 mode in a rectangular wave guide?
15. What are the root values for the TM modes?
16. Explain why TM01 & TM10 modes in a rectangular waveguides do not exist.

17. Draw the neat sketch showing the variation of attenuation with frequency for TE & TM waves in a wave guide.
18. Why the TE10 wave is called as dominant wave in rectangular wave guide?
19. Write the note on excitation of waveguides.
20. Draw the field patterns for the dominant mode of TE_{mm} wave in the circular waveguide.
21. Which is the most dominant mode in rectangular waveguide? Why?
22. *What is the Bessel's function?*
23. Write a short notes on guide termination.
24. What is the cut off frequency of TEM wave?
25. What is cavity resonator?

PART B

1. Explain about applications of Maxwells equations to the rectangular wave guides?
2. Derive the expressions for the field components of TE waves in a rectangular waveguide.
3. Explain about the various TEmn Modes and dominant TEmn mode in rectangular wave guide
4. A rectangular wave guide resonator of cross sectional dimensions 2.2cm*1 cm is filled with air. What should be the length of resonator for TE101 mode resonance at 10 GHZ? What is the next higer mode of resonance and the corresponding resonant frequency?
5. Explain the characteristic impedance of a rectangular waveguide and derive the expression for TE, TM and TEM waves.
6. An air filled rectangular wave guide of inside dimensions 7 * 3.5 cm operates in the dominant TE 10 mode.
   - i) Find the cut off frequency
   - ii) Determine the phase velocity at a frequency of 3.5 GHZ.
   - iii) Determine the guide wavelength at a frequency of 3.5 GHZ.
7. Design a rectangular wave guide with the following specifications
   - i) At a 7.5GHZ the guide wavelength for TE10 modes is 90% of the cut off wave length.
   - ii) TE30 & TE12 have the same cut off frequency.
8. Derive the expression for attenuation for TM11 waves in rectangular wave guide.
9. Explain how various modes can be excited in a rectangular wave guide.
10. Explain about resonant cavity?