Transmission Lines, Waveguides and Antennas

UNIT-1 MCQS

**1. What is the key difference between circuit theory and transmission line theory?**

a) Circuit theory deals with high-frequency signals only  
b) Transmission line theory assumes lumped elements  
c) Circuit theory assumes electrical size is much smaller than the wavelength  
d) Transmission lines cannot carry electromagnetic waves

**2. What is the characteristic impedance of a transmission line primarily dependent on?**

a) The material of conductors  
b) The frequency of the signal  
c) The uniform cross-sectional dimensions of the transmission line  
d) The voltage applied

**3. Which of the following is NOT a type of transmission line?**

a) Coaxial cable  
b) Microstrip line  
c) Parallel plate capacitor  
d) Twisted pair

**4. What does the series inductance (L) of a transmission line represent?**

a) Self-inductance of the two conductors  
b) Loss due to conductor resistance  
c) Energy storage in capacitors  
d) Conductance of the dielectric

**5. What type of losses do the series resistance (R) and shunt conductance (G) represent in a transmission line?**

a) Reflection losses  
b) Power losses  
c) Propagation losses  
d) None of the above

**6. The telegrapher’s equations describe the transmission line behavior in which domain?**

a) Frequency domain  
b) Time domain  
c) Laplace domain  
d) Spatial domain

**7. Which of the following transmission lines has a characteristic impedance that helps in minimizing reflections?**

a) A transmission line with non-uniform cross-section  
b) A transmission line with a uniform cross-section  
c) A transmission line with varying resistance along its length  
d) A transmission line with mismatched impedance

**8. What is the primary purpose of impedance matching in transmission lines?**

a) To increase the power dissipation  
b) To minimize reflections and maximize power transfer  
c) To decrease the frequency of the transmitted signal  
d) To introduce losses in the system

**9. Which of the following best describes a lossless transmission line?**

a) R=0 and G=0  
b) L=0 and C=0  
c) R≠0 and G≠0  
d) R=L=0

**10. If a transmission line is matched, what is the value of the reflection coefficient ?**

a) Γ=1

b) Γ=0  
c) Γ=−1  
d) Γ=∞

**11. In a transmission line, which component primarily contributes to the signal attenuation?**

a) Inductance (L)  
b) Capacitance (C)  
c) Resistance (R) and Conductance (G)  
d) Characteristic Impedance (Z0​)

**12. A transmission line is considered short when its length is:**

a) Less than λ/4  
b) Equal to λ/2  
c) Greater than λ  
d) Infinite in length

**13. Which parameter of a transmission line determines the signal velocity?**

a) Inductance (L)  
b) Capacitance (C)  
c) Dielectric constant of the medium  
d) All of the above

**14. In a transmission line, the characteristic impedance is primarily defined to:**

a) Maximize signal loss  
b) Prevent reflections  
c) Increase power dissipation  
d) Minimize the phase velocity

**15. The primary assumption in the lumped-element model of a transmission line is that:**

a) The physical dimensions are much larger than the wavelength  
b) Voltage and current remain constant throughout the line  
c) The transmission line is an ideal conductor  
d) Impedance matching is not necessary

**16. In a lossless transmission line, the attenuation constant (α) is:**

a) Zero  
b) Infinity  
c) Equal to the reflection coefficient  
d) Dependent on load impedance

**17. The reflection coefficient (Γ) is defined as:**

a) Ratio of incident voltage wave to reflected voltage wave  
b) Ratio of reflected voltage wave to incident voltage wave  
c) Ratio of transmission coefficient to insertion loss  
d) Sum of characteristic impedance and load impedance

**18. Standing waves in a transmission line occur when:**

a) The characteristic impedance is matched to the load  
b) There is a reflected wave interfering with the incident wave  
c) The transmission coefficient is zero  
d) The line is infinitely long

**19. The voltage standing wave ratio (VSWR) is always in the range:**

a) 0 ≤ VSWR ≤ 1  
b) 1 ≤ VSWR ≤ ∞  
c) -1 ≤ VSWR ≤ 1  
d) -∞ ≤ VSWR ≤ ∞

**20. What is the distance between two successive voltage maxima in a transmission line?**

a) λ/4  
b) λ/2  
c) λ  
d) 2λ

1. **Calculate the reflection coefficient when VSWR is 4.**
2. 5/3
3. 1
4. 3/5
5. 2/5

**22. The characteristic impedance of a transmission line with impedance and admittance of 16 and 9 respectively is**

1. 25
2. 1.33
3. 7
4. 0.75

**23. Return loss for a transmission line in terms of its reflection coefficient(**┌) **is given by**

a) -20logl┌l in dB  
b) -10logl┌l in dB  
c) -10log (1/l┌l) in dB  
d) -20log (1/l┌l) in dB

1. **Input impedance of a short circuited transmission line is**

a) -jZ0tanβl  
b) jZ0tanβl  
c) jZ0cotβl  
d) – jZ0cotβl

1. **For a λ/2 transmission line, if the characteristic impedance of the line is 50 Ω and the terminated with a load of 100 Ω, then its input impedance is:**

a) 100Ω  
b) 50Ω  
c) 88.86Ω  
d) none of the mentioned

1. **The relation between nepers and decibels is**

a) 1 Np= 8.686 dB

b) 1 dB=8.868 dB  
c) Np≥dB  
d) dB≥Np

1. **If a lossless transmission line with inductive reactance of 41.97 Ω and capacitive reactance of 1132.5Ω is operated at 1 GHz , then its phase constant is:**

a) 30.3  
b) 0.3  
c) 0.0305  
d) 0.6

1. **For a low loss line when both conductor and di-electric loss is small, the assumption that could be made is**

a) R > >ωC and G > >ωL  
b) R > > ωL and G > >ωC  
c) R < <ωC and G < < ωL  
d) R < < ωL and G < < ωC

1. **If the scattering matrix [S] of a two-port network is**

S=

Then the network is

1. Lossless and reciprocal

b)Lossless but not reciprocal

c)Not lossless but reciprocal

d)Neither lossless nor reciprocal

**30. To maximize power transfer, a lossless transmission line is to be matched to a resistive load impedance via a λ/4 transformer**

* **Lossless transmission line**
* **λ/4 transformer**
* **Zin=50Ω**
* **ZL=100Ω**

**The characteristic impedance (in Ω) of the λ/4 transformer is \_\_\_\_\_\_.**

1. 80 Ω
2. 70.71 Ω
3. 0
4. 90.5 Ω

### **31.Which parameter of the stub is adjusted to achieve impedance matching?**

a) Stub length only  
b) Stub position only  
c) Both stub length and position  
d) Neither stub length nor position

**32. The length of the stub in single stub matching is adjusted to:**

a) Change the characteristic impedance of the transmission line  
b) Introduce a reactance that cancels the load reactance  
c) Increase the power transfer efficiency  
d) Reduce the standing wave ratio (SWR) to zero

### **Which of the following statements is true about a point at the extreme right of the Smith Chart?**

1. It represents a perfect match  
   b) It corresponds to an open circuit  
   c) It represents a short circuit  
   d) It indicates a purely capacitive reactance

**34**. **A **lossless transmission line** has a characteristic impedance of **60 Ω** and a length of **λ/2**. If the load impedance is **30 Ω**, what is the input impedance?**

**(a)** 30 Ω  
**(b)** 60 Ω  
**(c)** 120 Ω  
**(d)** 90 Ω

**35.The transmission coefficient is always:**

a) Less than 1  
b) Greater than 1  
c) Equal to 1  
d) Dependent on the impedance mismatch

**36.Which of the following quantities CANNOT be directly determined using a Smith Chart?**

a) Reflection coefficient (Γ)  
b) Standing wave ratio (SWR)  
c) Voltage and current at a point on the transmission line  
d) Normalized impedance (Z/Z₀)

**37.Why can't voltage and current be directly determined from the Smith Chart?**

a) The Smith Chart only deals with power calculations  
b) The Smith Chart normalizes impedance and does not provide absolute values of V and I  
c) Voltage and current are not relevant in transmission line analysis  
d) The Smith Chart is only used for frequency domain analysis

**38.For a two-port network, S11 represents:**

a) The forward transmission coefficient  
b) The reverse transmission coefficient  
c) The input reflection coefficient  
d) The output reflection coefficient

**39.For a perfectly matched two-port network, which of the following is true?**

a) *S*11=0 and *S*22=0  
b) *S*11=1 and *S*22=1  
c) *S*21=0 and *S*12=0  
d) *S*11=*S*22=*S*21=*S*12=0

**40.The **skin effect** in transmission lines causes:**

**(a)** Increased resistance at high frequencies  
**(b)** Decreased inductance at high frequencies  
**(c)** Increased conductance at low frequencies  
**(d)** Decreased capacitance at low frequencies