Chettinad College of Engineering & Technology
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Department of Electronics and Communication Engineering

EC8651 – Transmission Line and Waveguide

Unit III - MCQ Bank

1. Slotted line is a transmission line configuration that allows the sampling of

a) electric field amplitude of a standing wave on a terminated line

b) magnetic field amplitude of a standing wave on a terminated line

c) voltage used for excitation

d) current that is generated by the source

Answer: a

Explanation: Slotted line allows the sampling of the electric field amplitude of a standing wave on a terminated line. With this device, SWR and the distance of the first voltage minimum from the load can be measured, from this data, load impedance can be found.

2. A slotted line can be used to measure _____ and the distance of _____________ from the load.

a) SWR, first voltage minimum

b) SWR, first voltage maximum

c) characteristic impedance, first voltage minimum

d) characteristic impedance, first voltage maximum

Answer: a

Explanation: With a slotted line, SWR and the distance of the first voltage minimum from the load can be measured, from this data, load impedance can be found.

3. A modern device that replaces a slotted line is:

a) Digital CRO

b) generators

c) network analyzers

d) computers

Answer: c

Explanation: Although slotted lines used to be the principal way of measuring unknown impedance at microwave frequencies, they have largely been superseded by the modern network analyzer in terms of accuracy, versatility and convenience.

4. If the standing wave ratio for a transmission line is 1.4, then the reflection coefficient for the line is:

a) 0.16667

b) 1.6667

c) 0.01667

d) 0.96

Answer: a

Explanation: Γ= (SWR-1)/ (SWR+1). Substituting for SWR in the above equation for reflection co-efficient, given SWR is 1.4, reflection co-efficient is 0.16667.

5. If the reflection coefficient of a transmission line is 0.4, then the standing wave ratio is:

a) 1.3333

b) 2.3333

c) 0.4

d) 0.6

Answer: b

Explanation: SWR= (1+ Γ)/ (1- Γ). Where Γ is the reflection co-efficient. Substituting for the reflection co-efficient in the equation, SWR is 2.3333.

6. Expression for Ѳ means phase angle of the reflection co efficient r=|r|-e^jθ, the phase of the reflection co-efficient is:

a) $\theta=2\pi+2\beta L_{min}$

b) $\theta=\pi+2\beta L_{min}$

c) $\theta=\pi/2+2\beta L_{min}$

d) $\theta=\pi+\beta L_{min}$

Answer: b

Explanation: here, θ is the phase of the reflection co-efficient. L_{min} is the distance from the load to the first minimum. Since voltage minima repeat every λ/2, any multiple of λ/2 can be added to L_{min} .

7. In the expression for phase of the reflection coefficient, L_{min} stands for :

a) distance between load and first voltage minimum

b) distance between load and first voltage maximum

c) distance between consecutive minimas

d) distance between a minima and immediate maxima

Answer: a

Explanation: L_{min} is defined as the distance between the terminating load of a transmission line and the first voltage minimum that occurs in the transmission line due to reflection of waves from the load end due to mismatched termination.

8. If SWR=1.5 with a wavelength of 4 cm and the distance between load and first minima is 1.48cm, then the reflection coefficient is:

a) 0.0126+j0.1996

b) 0.0128

c) 0.26+j0.16

d) none of the mentioned

Answer: a

Explanation: Γ= (SWR-1)/ (SWR+1). Substituting for SWR in the above equation for reflection co-efficient, magnitude of the reflection co-efficient is 0.2. To find θ, $\theta=\pi+2\beta L_{min}$, substituting L_{min} as 1.48cm, $\theta=86.4^0$. Hence converting the polar form of the reflection co-efficient into rectangular co-ordinates, reflection co-efficient is 0.0126+j0.1996.

9. If the characteristic impedance of a transmission line 50 Ω and reflection coefficient is 0.0126+j0.1996, then load impedance is:

a) 47.3+j19.7Ω

b) 4.7+j1.97Ω

c) 0.26+j0.16

d) data insufficient

Answer: a

Explanation: $Z_L=Z_0 (1+\Gamma)/ (1-\Gamma)$. Substituting the given values of reflection co-efficient and characteristic impedance, Z_L is 47.3+j19.7Ω .

10. If the normalized load impedance of a transmission line is 2, then the reflection co-efficient is:

a) 0.33334

b) 1.33334

c) 0

d) 1

Answer:a

Explanation: $Z_L=Z_0 (1+\Gamma)/ (1-\Gamma)$, this is the expression for load impedance. Normalized load impedance is the ratio of load impedance to the characteristic impedance, taking ZL_L/Z_0 as 2, the reflection co-efficient is equal to 0.33334.

11. A quarter wave transformer is useful for matching any load impedance to a transmission line.

a) True

b) False

Answer: b

Explanation: Quarter wave transformers are a simple circuit that can be used to match real load impedance to a transmission line. Quarter wave transformers cannot be used to match complex load impedances to a transmission line.

12. Major advantage of a quarter wave transformer is:

a) It gives proper matching

b) It gives high gain

c) Broader bandwidth

d) None of the mentioned

Answer: c

Explanation: Quarter-wave transformers can be extended to multi section designs in a methodical manner to provide a broader bandwidth.

13. If a narrow band impedance match is required, then more multi section transformers must be used.

a) True

b) False

Answer: b

Explanation: If a narrow band impedance match is required, then a single section of quarter wave transformer is used. When a wideband impedance match is required, then multi-section quarter wave transformers must be used for impedance matching.

14. The major drawback of the quarter wave transformer that it cannot match complex load to a transmission line cannot be overcome.

a) True

b) False

Answer: b

Explanation: The major drawback of the quarter wave transformer that it cannot match complex load to a transmission line can be overcome by transforming complex load impedance to real load impedance.

15. Complex load impedance can be converted to real load impedance by:

a) Scaling down the load impedance

b) By introducing an approximate length of transmission line between load and quarter wave transformer

c) Changing the operating wavelength

d) None of the mentioned

Answer: b

Explanation: By introduction of a transmission line of suitable length between the load and the quarter wave transformer, the reactive component of the load that is the complex value can be nullified thus leaving behind only real load impedance to be matched.

16. Converting complex load into real load for impedance matching has no effect on the bandwidth of the match.

a) True

b) False

Answer: b

Explanation: Adding a length of line to the transmission line between the load and quarter wave transformer alters the frequency dependence of the load thus altering the bandwidth of the match.

17. If a single section quarter wave transformer is used for impedance matching at some frequency, then the length of the matching line is:

a) Is different at different frequencies

b) Is a constant

c) Is λ/2 for other frequencies

d) None of the mentioned

Answer: a

Explanation: The length of the matching section is λ/4 for the frequency at which it is matched. For other frequencies, the electrical length varies. For multi section transformers, a wide bandwidth can be achieved.

18. Quarter wave transformers cannot be used for non-TEM lines for impedance matching.

a) True

b) False

Answer: a

Explanation: For non-TEM lines, propagation constant is not a linear function of frequency and the wave impedance is frequency dependent. These factors complicate the behavior of the quarter wave transformer for non-TEM lines.

19. The reactances associated with the transmission line due to discontinuities:

a) Can be ignored

b) Have to matched

C Discontinuities do not exist

d) None of the mentioned

Answer: b

Explanation: Reactance due to discontinuities in the transmission line contribute to the impedance, they can be matched by altering the length of the matching section.

20. If a load of 10Ω has to be matched to a transmission line of characteristic impedance of 50Ω, then the characteristic impedance of the matching section of the transmission line is:

a) 50Ω

b) 10Ω

c) 22.36Ω

d) 100Ω

Answer: c

Explanation: Characteristic impedance of the matching section of a transmission line is given by $Z1=\sqrt{Z_o.ZL}$. Substituting the given impedance values, the characteristic impedance of the matching section is 22.36 Ω.

21. The major advantage of single stub tuning over other impedance matching techniques is:

a) Lumped elements are avoided

b) It can be fabricated as a part of transmission line media

c) It involves two adjustable parameters

d) All of the mentioned

Answer: d

Explanation: Single stub matching does not involve any lumped elements, it can be fabricated as a part of transmission media and it also involves to adjustable parameters namely length and distance from load giving more flexibility.

22. Shunt stubs are preferred for:

a) Strip and microstrip lines

b) Coplanar waveguides

c) Circular waveguide

d) Circulators

Answer: a

Explanation: Since microstrip and strip lines are simple structures, impedance matching using shunt stubs do not increase the complexity and structure of the transmission line. Hence, shunt stubs are preferred for strip and microstrip lines.

23. The two adjustable parameters in single stub matching are distance‘d’ from the load to the stub position, and _________

a) Susceptance or reactance provided by the stub

b) Length of the stub

c) Distance of the stub from the generator

d) None of the mentioned

Answer: a

Explanation: Reactance or susceptance of the matching stub must be known before it used for matching, since it is the most important parameter for impedance matching between the load and the source.

24. In shunt stub matching, the key parameter used for matching is:

a) Admittance of the line at a point

b) Admittance of the load

c) Impedance of the stub

d) Impedance of the load

Answer: a

Explanation: In shunt stub tuning, the idea is to select d so that the admittance Y, seen looking into the line at distance d from the load is of the form Y_o+jb) Then the stub susceptance is chosen as –jB, resulting in a matched condition.

25. For series stub matching, the parameter used for matching is:

a) Impedance of the transmission line at a point

b) Voltage at a point on the transmission line

c) Admittance at a point on the transmission line

d) Admittance of the load

Answer: a

Explanation: In series sub matching, the distance‘d’ is selected so that the impedance, Z seen looking into the line at a distance‘d’ from the load is of the form Z_o+jX. Then the stub reactance is chosen as –jX resulting in a matched condition.