Chettinad College of Engineering & Technology
Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai.

Department of Electronics and Communication Engineering

EC8651 – Transmission Line and Waveguide

Unit II - MCQ Bank

1.The characteristic impedance of a quarter wave transformer with load and input impedances given by 30 and 75 respectively is

a) 47.43

b) 37.34

c) 73.23

d) 67.45

Answer: a

Explanation: In quarter wave transformer, the characteristic impedance will be the geometric mean of the input impedance and the load impedance. Thus $Zo^2 = Z_{IN}\ Z_L$. On substituting for $Z_{IN} = 75$ and $Z_L = 30$, we get the characteristic impedance as 47.43 units.

2.The input impedance of a quarter wave line 50 ohm and load impedance of 20 ohm is

a) 50

b) 20

c) 1000

d) 125

Answer: d

Explanation: The characteristic impedance will be the geometric mean of the input impedance and the load impedance. Thus Zo^2 = Zin ZL. On substituting for Zo = 50 and ZL = 20, we get the input impedance as $50^2/20 = 125$ ohm.

3. For a matched line, the input impedance will be equal to

a) Load impedance

b) Characteristic impedance

c) Output impedance

d) Zero

Answer: b

Explanation: A matched line refers to the input and characteristic impedance being the same. In such condition, maximum transmission will occur with minimal losses. The reflection will be very low.

4. The reflection coefficient lies in the range of

a) $0 < \tau < 1$

b) $-1 < \tau < 1$

c) $1 < \tau < \infty$

d) $0 < \tau < \infty$

Answer: a

Explanation: The reflection coefficient lies in the range of $0 < \tau < 1$. For full transmission, the reflection will be zero. For no transmission, the reflection will be unity.

5. When the ratio of load voltage to input voltage is 5, the ratio of the characteristic impedance to the input impedance is

a) 1/5

b) 5

c) 10

d) 25

Answer: b

Explanation: From the transmission line equation, the ratio of the load voltage to the input voltage is same as the ratio of the characteristic impedance to the input impedance. Thus the required ratio is 5.

6. The power of the transmitter with a radiation resistance of 12 ohm and an antenna current of 3.5A is

a) 147

b) 741

c) 174

d) 471

Answer: a

Explanation: The power in a transmitter is given by Prad = $Iant^2$ Rrad. On substituting Irad = 3.5 and Rrad =12, we get Prad = 3.5^2 x 12 = 147 units.

7. The group delay of the wave with phase constant of 62.5 units and frequency of 4.5 radian/sec is

a) 13.88

b) 31.88

c) 88.13

d) 88.31

Answer: a

Explanation: The group delay is given by td = β/ω. Given that β = 62.5 and ω = 4.5, we get the group delay as td = 62.5/4.5 = 13.88 units.

8.The maximum impedance of a transmission line 50 ohm and the standing wave ratio of 2.5 is

a) 20

b) 125

c) 200

d) 75

Answer: b

Explanation: The maximum impedance of a line is given by Zmax = SZo. On substituting for S = 2.5 and Zo = 50, we get Zmax = 2.5 x 50 = 125 ohm.

9. The minimum impedance of a transmission line 75 ohm with a standing wave ratio of 4 is

a) 75

b) 300

c) 18.75

d) 150

Answer: c

Explanation: The minimum impedance of a line is given by Zmin = Zo/S. On substituting for Zo = 75 and S = 4, we get Zmin = 75/4 = 18.75 units.

10. The average power in an electromagnetic wave is given by

a) propagation constant

b) poynting vector

c) phase constant

d) attenuation constant

Answer: b

Explanation: The Poynting vector is the cross product of the electric field and magnetic field intensities. It gives the total power of an electromagnetic wave.

11. Standing waves occurs due to

a) Impedance match

b) Impedance mismatch

c) Reflection

d) Transmission

Answer: b

Explanation: Impedance mismatches result in standing waves along the transmission line. It shows the variation of the wave amplitudes due to mismatching.

12. Standing wave ratio is defined as the

a) Ratio of voltage maxima to voltage minima

b) Ratio of current maxima to current minima

c) Product of voltage maxima and voltage minima

d) Product of current maxima and current minima

Answer: a

Explanation: SWR is defined as the ratio of the partial standing wave's amplitude at an antinode (maximum) to the amplitude at a node (minimum) along the line. It is given by $S = V_{MAX}/V_{MIN}$.

13. Given that the reflection coefficient is 0.6. Find the SWR.

a) 2

b) 4

c) 6

d) 8

Answer: b

Explanation: The relation between reflection coefficient and SWR is given by S = 1 + R/1 – R. On substituting for R = 0.6, we get S = 1 + 0.6/1 – 0.6 = 1.6/0.4 = 4.

14. The maxima and minima voltage of the standing wave are 6 and 2 respectively. The standing wave ratio is

a) 2

b) 3

c) 1/2

d) 4

Answer: b

Explanation: The ratio of voltage maxima to voltage minima is given by the standing wave ratio SWR. Thus $S = V_{MAX}/V_{MIN}$. On substituting the given data, we get S = 6/2 = 3.

15. Find the standing wave ratio, when a load impedance of 250 ohm is connected to a 75 ohm line.

a) 0.3

b) 75

c) 250

d) 3.33

Answer: d

Explanation: The standing wave ratio is the ratio of the load impedance to the characteristic impedance. Thus S = ZL/Zo. On substituting for ZL = 250 and Zo = 75, we get S = 250/75 = 3.33.

16.Find the reflection coefficient of the wave with SWR of 3.5.

a) 0.55

b) 0.23

c) 0.48

d) 0.68

Answer: a

Explanation: The reflection coefficient in terms of the SWR is given by R = S – 1/S + 1. On substituting for S = 3.5, we get 3.5 – 1/3.5 + 1 = 0.55.

17. The range of the standing wave ratio is

a) $0 < S < 1$

b) $-1 < S < 1$

c) $1 < S < \infty$

d) $0 < S < \infty$

Answer: c

Explanation: The standing wave ratio is given by S = 1 – R/1 + R. Thus the minimum value of S is 1. It can extend upto infinity for long lines. Thus the range is $1 < S < \infty$.

18. For matched line, the standing wave ratio will be

a) 0

b) ∞

c) -1

d) 1

Answer: d

Explanation: In a matched line, maximum transmission occurs. The reflection will be zero. The standing wave ratio S = 1 – R/1 + R. For R = 0, the SWR is unity for matched line.

19. The maximum impedance of a 50 ohm transmission line with SWR of 3 is

a) 50/3

b) 3/50

c) 150

d) 450

Answer: c

Explanation: The maximum impedance is given by the product of the characteristic impedance and the SWR. Thus Z_{max} = S Zo. On substituting for S = 3 and Zo = 50, we get Z_{MAX} = 3 X 50 = 150 units.

20. The minimum impedance of a 75 ohm transmission line with a SWR of 2.5 is

a) 100

b) 50

c) 25

d) 30

Answer: d

Explanation: The minimum impedance in terms of SWR is given by Z_{MIN} = Zo/S. Substituting the given data for S = 2.5 and Zo = 75, we get Z_{min} = 75/2.5 = 30.

21.The power of the electromagnetic wave with electric and magnetic field intensities given by 12 and 15 respectively is

a) 180

b) 90

c) 45

d) 120

Answer: b

Explanation: The Poynting vector gives the power of an EM wave. Thus P = EH/2. On substituting for E = 12 and H = 15, we get P = 12 x 15/2 = 90 units.

22. The power of a wave of with voltage of 140V and a characteristic impedance of 50 ohm is

a) 1.96

b) 19.6

c) 196

d) 19600

Answer: c

Explanation: The power of a wave is given by $P = V^2/2Zo$, where V is the generator voltage and Zo is the characteristic impedance. On substituting the given data, we get $P = 140^2/(2\times50) = 196$ units.

23. The power reflected by a wave with incident power of 16 units is(Given that the reflection coefficient is 0.5)

a) 2

b) 8

c) 6

d) 4

Answer: d

Explanation: The fraction of the reflected to the incident power is given by the reflection coefficient. Thus $Pref = R^2 x Pinc$. On substituting the given data, we get $Pref = 0.5^2 \times 16 = 4$ units.

24. The power transmitted by a wave with incident power of 16 units is(Given that the reflection coefficient is 0.5)

a) 12

b) 8

c) 16

d) 4

Answer: a

Explanation: The fraction of the transmitted to the incident power is given by the reflection coefficient. Thus Pref = $(1-R^2)$ Pinc. On substituting the given data, we get Pref = $(1- 0.5^2)$ x 16 = 12 units. In other words, it is the remaining power after reflection.

25. The incident and the reflected voltage are given by 15 and 5 respectively. The transmission coefficient is

a) 1/3

b) 2/3

c) 1

d) 3

Answer: b

Explanation: The ratio of the reflected to the incident voltage is the reflection coefficient. It is given by R = 5/15 = 1/3. To get the transmission coefficient, T = 1 – R = 1 – 1/3 = 2/3.