



قائمة الاسئلة

(60) هندسة موجات دقيقة - كلية الهندسة - قسم الكهرباء - المستوى ...الرابع.. - ...التخصصاتصالات.. -..الزمن ثلاث ساعات.. - درجة هذا الاختبار
د. محمد الوداعي

- 1) (1 Mark). If a transmission line with inductive reactance of 41.97Ω and capacitive reactance of 1132.5Ω is operated at 1 GHz , then its phase constant is:
a) 0.0305
b) 0.3
c) 30.3
d) 0.6
- 1) ☒ a
2) ☐ b
3) ☐ c
4) ☐ d
- 2) (1 Mark). Transmission line is a ----- parameter network.
a) lumped
b) distributed
c) active
d) none of the mentioned
- 1) ☐ a
2) ☒ b
3) ☐ c
4) ☐ d
- 3) (1 Mark). Which of the following is not a disadvantage of microwaves?
a) Higher-cost equipment
b) Line-of-sight transmission
c) Conventional components are not usable
d) Circuits are more difficult to analyze
- 1) ☒ a
2) ☐ b
3) ☐ c
4) ☐ d
- 4)



(1 Mark) If the wavelength of a signal is 10 mm, then the wavenumber of the material when a waveguide is filled with that material is:

- a) 123
- b) 345
- c) 628
- d) None of the mentioned

- 1) - a
- 2) - b
- 3) + c
- 4) - d

5) (1 Mark) If the wave impedance of a medium is 200Ω , then what is the relative permittivity of that medium?

- a) 1.885
- b) 2
- c) 2.5
- d) 3.553

- 1) - a
- 2) - b
- 3) - c
- 4) + d

6) (1 Mark) If the wave number of a medium is 20 and loss tangent is 0.4, then the dielectric loss caused by the medium is:

- a) 2
- b) 3
- c) 4
- d) 6

- 1) - a
- 2) - b
- 3) + c
- 4) - d

7) (1 Mark). For TE_{10} mode, if the waveguide is filled with air and the broader dimension of the waveguide is 2 cm, then the cutoff frequency is:

- a) 5 MHz
- b) 7.5 MHz
- c) 7.5 GHz
- d) 5 GHz

- 1) - a
- 2) - b
- 3) + c



4) - d

8) **(1 Mark). The lowest mode of TM wave propagation is:**

- a) TM_{00} mode
- b) TM_{01} mode
- c) TM_{10} mode
- d) TM_{11} mode

1) - a

2) - b

3) - c

4) + d

9) **(1 Mark). Ionospheric preparation is not possible for microwaves because**

- a) Microwaves will be fully absorbed by the ionospheric layers
- b) There will be an abrupt scattering in all directions
- c) Microwave will penetrate through the ionospheric layers
- d) There will be dispersion of microwave energy

1) - a

2) - b

3) + c

4) - d

10) **(1 Mark). Shunt stubs are preferred for:**

- a) Strip and microstrip lines
- b) Coplanar waveguides
- c) Circular waveguide
- d) Circulators

1) + a

2) - b

3) - c

4) - d

11)



(1 Mark) In a double stub tuner circuit, the load is of ----- length from the first stub.

- a) fixed length
- b) arbitrary length
- c) depends on the load impedance to be matched
- d) depends on the characteristic impedance of the transmission line

- 1) - a
- 2) ☒ b
- 3) - c
- 4) - d

12) (1 Mark) A quarter wave transformer is useful for matching any load impedance to a transmission line.

- a) True
- b) False

- 1) - a
- 2) ☒ b

13) (1 Mark) 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

- 1) - a
- 2) - b
- 3) ☒ c
- 4) - d

14) (1 Mark) Which of the following is not possible in a circular wave guide?

- a) TE_{10}
- b) TE_{01}
- c) TE_{11}
- d) TE_{12}

- 1) ☒ a
- 2) - b
- 3) - c
- 4) - d

15) (1 Mark) If the admittance and the impedance of a transmission line are 100Ω and 50Ω of a respectively, then value of phase constant β is:

- a) 70.71
- b) 50
- c) 20
- d) 0



- 1) - a
2) - b
3) - c
4) ☒ d
- 16) (1 Mark) If the characteristic impedance of a transmission line is 50Ω and reflection coefficient $\Gamma = 1$, then its load impedance
a) 0Ω
b) 50Ω
c) $\infty \Omega$
d) Z_L is unreasonable.
- 1) - a
2) - b
3) ☒ c
4) - d
- 17) (1 Mark) If the width of a parallel plate waveguide is 30 mm and the distance between the parallel plates is 5 mm, with an intrinsic impedance of 377Ω , then the characteristic impedance of the wave is:
a) 50Ω
b) 62.833Ω
c) 100Ω
d) None of the mentioned
- 1) - a
2) ☒ b
3) - c
4) - d
- 18) (1 Mark) For TM₂ mode, if the distance between two parallel plates of a waveguide are 40 mm, then the cut off wavelength for TM₂ mode is:
a) 20 mm
b) 80 mm
c) 40 mm
d) 60 mm
- 1) - a
2) - b
3) ☒ c
4) - d
- 19) (1 Mark) One of the most important factors to be considered in the selection of a particular matching network is:
a) noise component
b) amplification factor
c) bandwidth
d) all of the mentioned
- 1) - a
2) - b
3) ☒ c
4) - d
- 20) (2 Marks) An 'L' network is required to match a load impedance of 40Ω to a transmission line of characteristic impedance 60Ω . The components of the L network are:
a) 50Ω
b) 48.9Ω
c) $28.28+j1 \Omega$
d) $28.28+j0 \Omega$



- 1) - a
2) - b
3) - c
4) + d
- 21) (2 Marks) A section of X-band waveguide with dimensions $a = 2.286$ cm and $b = 1.016$ cm and has perfectly conducting walls and is filled with a lossy dielectric ($\sigma_d = 367.5 \mu S/m, \epsilon_r = 2.1, \mu_r = 1$). Find the attenuation factor, in dB/m, for the dominant mode of propagation at a frequency of 9 GHz.
a) 0.48 dB/m
b) 0.61 dB/m
c) 0.697 dB/m
d) 0.88 dB/m
- 1) - a
2) + b
3) - c
4) - d
- 22) (2 Marks) An X-band air-dielectric rectangular waveguide has brass walls ($\sigma_w = 16 MS/m, \mu_w = \mu_0$) with dimensions $a = 2.286$ cm and $b = 1.016$ cm. Find the dB/m of attenuation due to wall loss when the dominant mode is propagating at 9.6 GHz.
a) 0.67 dB/m
b) 0.107 dB/m
c) 0.214 dB/m
d) 0.428 dB/m
- 1) - a
2) - b
3) + c
4) - d
- 23) (1 Mark) The wave impedance for a non-propagating mode in TE mode is:
a) K/β
b) Imaginary
c) Zero
d) Non-existing
- 1) - a
2) + b
3) - c
4) - d
- 24) (1 Mark) The lowest mode of TE mode propagation in a circular waveguide is:
a) TE_{01} mode
b) TE_{00} mode
c) TE_{10} mode
d) TE_{11} mode
- 1) + a
2) - b
3) - c
4) - d
- 25)



(2 Marks) Find the cutoff frequencies of the first two propagating modes of a Teflon-filled circular waveguide with $a = 0.5$ cm and $\epsilon_r = 2.08$.

n	p'_{n1}	p'_{n2}	p'_{n3}	p_{n1}	p_{n2}	p_{n3}
0	3.832	7.016	10.174	2.405	5.520	8.654
1	1.841	5.331	8.536	3.832	7.016	10.174
2	3.054	6.706	9.970	5.135	8.417	11.620

- a) the first two propagating modes are TE_{01} ($f_{c01} = 8.19$ GHz) and TM_{01} ($f_{c01} = 15.92$ GHz)
b) the first two propagating modes are TE_{11} ($f_{c11} = 12.19$ GHz) and TM_{10} ($f_{c10} = 9.97$ GHz)
c) the first two propagating modes are TE_{11} ($f_{c11} = 12.19$ GHz) and TM_{01} ($f_{c01} = 15.92$ GHz)
d) the first two propagating modes are TE_{10} ($f_{c10} = 11.44$ GHz) and TM_{10} ($f_{c10} = 9.97$ GHz)

- 1) - a
2) - b
3) + c
4) - d

26) (2 Marks) A Teflon-filled circular waveguide with $a = 0.5$ cm and $\epsilon_r = 2.08$. If the interior of the guide is gold plated with conductivity of 4.1×10^7 S/m, calculate the overall loss in dB for a 30 cm length operating at 14 GHz. (Hint: $\tan \delta = 0.0004$)

- a) attenuation = 2.07 dB
b) attenuation = 0.62 dB
c) attenuation = 0.75 dB
d) attenuation = 0.583 dB

- 1) - a
2) + b
3) - c
4) - d

27) (1 Mark). The dominant waveguide mode of a coaxial line is:

- a) TE_{11} mode
b) TE_{01} mode
c) TM_{01} mode
d) TEM mode

- 1) + a
2) - b
3) - c
4) - d

28) (1 Mark). If the phase velocity in a stripline is 2.4×10^8 m/s, and the capacitance per unit length of a micro stripline is 10 pF/m, then the characteristic impedance of the line is:

- a) 50 Ω
b) 41.6 Ω
c) 100 Ω
d) None of the mentioned

- 1) - a
2) + b
3) - c
4) - d

29)



(1 Mark). Which mode of propagation is supported by a strip line?

- a) TEM mode
- b) TM mode
- c) TE mode
- d) None of the mentioned

- 1) ☒ a
- 2) ☐ b
- 3) ☐ c
- 4) ☐ d

30) (2 Marks). Design an L-section matching network to match the load with an impedance

$Z_L = 100 - j50 \Omega$ to 75Ω line at a frequency of 1 GHz. (b

- a) 1st sol. (L = 15 nH and C = 2.6 pF) & 2nd sol. (C = 0.402 pF and L = 9.74 nH)
- b) 1st sol. (C = 0.12 pF and L = 0.26 pF) & 2nd sol. (L = 0.402 nH and L = 9.7 nH)
- c) 1st sol. (C = 1.22 pF and L = 2.6 nH) & 2nd sol. (L = 0.402 nH and C = 0.74 pF)
- d) 1st sol. (L = 0.67 nH and C = 0.26 pF) & 2nd sol. (C = 40.2 pF and C = 0.94 pF)

- 1) ☒ a
- 2) ☐ b
- 3) ☐ c
- 4) ☐ d

31) (1 Mark). 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

- 1) ☐ a
- 2) ☐ b
- 3) ☐ c
- 4) ☒ d

32) (1 Mark). The two adjustable parameters in single stub matching are distance 'd' from the load to the stub position, and -----

- a) Length of the stub
- b) Distance of the stub from the generator
- c) Susceptance or reactance provided by the stub
- d) None of the mentioned

- 1) ☐ a
- 2) ☐ b
- 3) ☒ c
- 4) ☐ d

33) (1 Mark). 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

- 1) ☒ a
- 2) ☐ b
- 3) ☐ c



- 4) - d
- 34) (1 Mark). The major disadvantage of single stub tuning is:
a) it involves 2 variable parameters
b) complex calculation
c) it requires a variable length of line between the load and the stub
d) none of the mentioned
- 1) - a
2) - b
3) + c
4) - d
- 35) (1 Mark) A quarter wave transformer is useful for matching any load impedance to a transmission line.
a) True
b) False
- 1) - a
2) + b
- 36) (1 Mark) 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
- 1) - a
2) - b
3) + c
4) - d
- 37) (1 Mark) 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
- 1) - a
2) + b
3) - c
4) - d
- 38) (1 Mark) If a single section quarter wave transformer is used for impedance matching at some frequency, then the length of the matching line is:
a) different at different frequencies
b) a constant
c) $\lambda/2$ for other frequencies
d) None of the mentioned
- 1) + a
2) - b
3) - c
4) - d
- 39) (1 Mark) Quarter wave transformers cannot be used for non-TEM lines for impedance matching.
a) True
b) False



- 1) ☒ a
2) ☐ b
3) ☐ c
4) ☐ d
- 40) (1 Mark) If a load of $10\ \Omega$ has to be matched to a transmission line of characteristic impedance of $50\ \Omega$, then the characteristic impedance of the matching section of the transmission line is:
a) $10\ \Omega$
b) $22.36\ \Omega$
c) $50\ \Omega$
d) $100\ \Omega$
- 1) ☐ a
2) ☒ b
3) ☐ c
4) ☐ d
- 41) (1 Mark). Which of the following are the disadvantages of microwaves?
a) The cost of equipment or installation is prohibitively expensive.
b) They are heavier and take up more room
c) Electromagnetic interference is possible
d) All of the above
- 1) ☐ a
2) ☐ b
3) ☐ c
4) ☒ d
- 42) (1 Mark). Which of the following statement is TRUE?
a) Reflection coefficient is the metric that describes the amount of reflected energy caused by Characteristic Impedance in a transmission line
b) Reflection coefficient is the metric that describes the amount of reflected energy caused by an impedance mismatch in a transmission line
- 1) ☐ a
2) ☒ b
3) ☐ c
4) ☐ d
- 43) (1 Mark). The loss caused by signal absorption in the transmission line is known as -----
a) Attenuation loss.
b) Reflection loss.
c) Transmission loss.
d) Return loss.
- 1) ☒ a
2) ☐ b
3) ☐ c
4) ☐ d
- 44) (1 Mark) ----- is the main advantage of a microwave.
a) High penetration power
b) Moves at the speed of light
c) Highly directive
d) None of these
- 1) ☐ a



- 2) - b
- 3) + c
- 4) - d

45) (1 Mark) The main disadvantage of using coaxial cable for microwave signals is its

- a) High attenuation
- b) High sensitivity
- c) Low distortion
- d) Low selectivity

- 1) + a
- 2) - b
- 3) - c
- 4) - d

46) (1 Mark) Which of the following has a characteristic impedance?

- a) Waveguides
- b) Transmission lines
- c) Both (a) and (b).

- 1) - a
- 2) + b
- 3) - c
- 4) - d

47) (1 Mark) What is phase velocity?

- a) The speed with which the phase of a transmission line propagates across a fixed medium is referred to as phase velocity
- b) The speed with which the phase of a transmission line propagates across a fixed bandwidth is referred to as phase velocity
- c) The speed with which the phase of a wave propagates across a medium is referred to as phase velocity

- 1) - a
- 2) - b
- 3) + c
- 4) - d

48) (1 Mark) The electric and magnetic fields in which mode of propagation are truly perpendicular to the direction of wave propagation?

- a) TEM (Transverse Electromagnetic Wave)
- b) TE Transverse Electric Wave)
- c) TM (Transverse Magnetic Wave)
- d) Both (b) and (c).

- 1) + a
- 2) - b
- 3) - c
- 4) - d

49) (1 Mark) In microwave engineering, what does the term "cutoff frequency" refer to?

- a) The frequency at which the amplifier stops working
- b) The frequency above which signals get distorted
- c) The frequency at which a microwave circuit resonates
- d) The frequency below which the waveguide can transmit signals effectively

- 1) - a
- 2) - b
- 3) - c



4) ☒ d

- 50) (1 Mark) What is the typical characteristic impedance of a microstrip transmission line?
a) 25 ohms
b) 50 ohms
c) 75 ohms
d) 100 ohms

1) - a

2) ☒ b

3) - c

4) - d

- 51) (1 Mark) What is the primary advantage of using a coaxial cable in microwave systems?
a) It has low loss at high frequencies
b) It is flexible and easy to install
c) It is resistant to electromagnetic interference
d) All of the above

1) - a

2) - b

3) - c

4) ☒ d

- 52) (1 Mark) What is the main advantage of using a circular waveguide over a rectangular waveguide?
a) It has lower attenuation
b) It is more compact
c) It supports multiple propagation modes
d) It is easier to manufacture

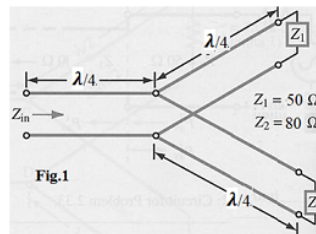
1) - a

2) - b

3) ☒ c

4) - d

- 53) (2 Marks). Two loads $Z_1 = 50 \Omega$ and $Z_2 = 80 \Omega$ are connected as shown in Fig.1. All lines are lossless with $Z_0 = 50 \Omega$ and have $\lambda/2$ length. Find Z_{in} of the feed line.
a) $Z_{in} = 27.24 \Omega$
b) $Z_{in} = 50 \Omega$
c) $Z_{in} = 81.25 \Omega$
d) $Z_{in} = 100 \Omega$



1) - a

2) - b

3) ☒ c

4) - d