



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(ECE)(SEPARATE SUPPLE)/SEM-8/EC-804E/2011

2011

MICROWAVE CIRCUITS & SYSTEMS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

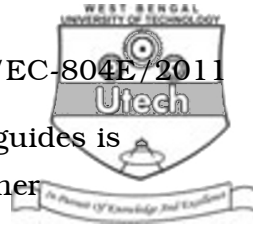
GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$$10 \times 1 = 10$$

- i) For handling of high microwave power, the best medium is
 - a) coaxial line
 - b) reactangular waveguide
 - c) stripline
 - d) microstrip line.
- ii) Wavelength of electromagnetic wave in a waveguide
 - a) is inversely proportional to the phase velocity
 - b) is greater than that in free space
 - c) is directly proportional to phase velocity
 - d) depends only on the waveguide dimensions and free space wavelength.



- iii) The advantage of strip line over waveguides is
 - a) its power handling capacity is higher
 - b) smaller size
 - c) smaller bandwidth
 - d) low cost.
- iv) The dominant mode for a rectangular waveguide is
 - a) TE_{01}
 - b) TM_{11}
 - c) TE_{10}
 - d) TE_{20}
- v) A coupling probe is placed at a point
 - a) where the electrical field has maximum intensity
 - b) where the magnetic field has maximum intensity
 - c) where the electric field has least value
 - d) where the magnetic field has least value.
- vi) A microwave junction is supposed to be matched at all ports if in the S-matrix
 - a) all the diagonal elements are zero
 - b) all the diagonal elements are equal but not zero
 - c) all the diagonal elements are complex
 - d) is hermitian.
- vii) A duplexer is used to
 - a) couple two antennas to a transmitter without interference
 - b) isolate the antenna from local oscillator
 - c) prevent interference between two antennas connected to receiver
 - d) varying the wave impedance.
- viii) Side-lobe of an antenna pattern causes
 - a) reduced bandwidth
 - b) reduced antenna gain
 - c) ambiguity in direction finding
 - d) increase antenna gain.



- ix) Probe coupling is
- electrostatic
 - magnetic
 - either magnetic or electrostatic
 - none of these.
- x) Slow-wave propagation occurs in
- Tee junction
 - Directional coupler
 - Periodic structure
 - Ferrite structure.
- xi) The dominant mode in a waveguide is characterized by
- longest cut-off wavelength
 - shortest cut-off wavelength
 - infinite attenuation
 - zero attenuation.
- xii) If VSWR = 1, then reflection coefficient is
- 0
 - 1
 - 1
 - ∞ .

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- What is Ferrites ? Explain the operation of a 3-port ferrite circulator. 1 + 4
- Explain the operation of Wilkinson power divider. 5
- Briefly discuss the Binomial transformer used in Impedance matching techniques. 5
- Discuss different types of discontinuities in rectangular waveguide using their equivalent circuit. 5
- Establish the relationship between S-parameter and ABCD parameter. 5



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Discuss the different steps of filter design by Image parameter method.
b) Explain Impedance and frequency scaling techniques used in Filter transformation. $8 + 7$
8. a) Establish the scattering matrix of a three port Tee junction.
b) Write down the applications of directional coupler.
c) Explain the operating principle of Lange coupler. $7 + 3 + 5$
9. a) Write down the properties of the filter made up of a coupled line section.
b) Briefly explain single stub tuning technique.
c) Write down the comparison between single stub tuning and double stub tuning. $6 + 5 + 4$
10. a) Derive the S-matrix of a directional coupler
b) Briefly discuss different properties of s-parameters for junction of ports having common characteristics impedance. $10 + 5$
11. Write short note on any *three* of the following : 3×5
- a) Quarter wave transformer
 - b) Tapered Lines
 - c) Signal flow graph
 - d) Branch line directional coupler
 - e) Noise in Microwave
 - f) Smart Antenna.