



Name :
Roll No. :
Invigilator's Signature :

CS/M.TECH(ECE)/SEM-1/MCE-104/2011-12

2011

ADVANCED MICROWAVE COMMUNICATION ENGINEERING

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 × 1 = 10

- i) Gunn diode is fabricated on
 - a) *n*-type Si
 - b) *n*-type GaAs
 - c) *p*-type GaAs
 - d) *n*-type Ge.
- ii) IMPATT is an acronym for
 - a) Impulse Associated Transit Time
 - b) Impact Aided Transit Time
 - c) Impact Ionization Avalanche Transit Time
 - d) Impact Transit Time.
- iii) Impact ionization rate is the No. of EPH produced
 - a) per unit time
 - b) per unit distance
 - c) per unit time and distance
 - d) per unit volume.



- iv) The Gunn diode belongs to the family of
 - a) Avalanche Transit Time device
 - b) Ballistic injection device
 - c) Single Electron device
 - d) Transferred Electron device.
- v) Tunnel diode exhibits
 - a) current controlled negative resistance
 - b) voltage controlled negative resistance
 - c) temperature controlled negative resistance
 - d) pressure controlled negative resistance.
- vi) The most efficient and powerful structure of IMPATT diode is
 - a) Read diode
 - b) SDR diode
 - c) DDR diode
 - d) PiN diode.
- vii) Scattering parameters can be measured with the help of
 - a) Spectrum analyzer
 - b) CRO
 - c) Vector network analyzer
 - d) digital storage.
- viii) In a microstrip antenna the radiation mostly takes place from
 - a) patch edges
 - b) patch centre
 - c) top surface of patch
 - d) bottom surface of patch.
- ix) An ideal directional coupler has the value of directivity equal to
 - a) 0
 - b) infinity
 - c) 10 dB
 - d) 30 dB.
- x) A cavity is a
 - a) band pass filter
 - b) high pass filter
 - c) band stop filter
 - d) low pass filter.



- xi) Attenuators consist of
- resistor only
 - capacitor only
 - inductor only
 - resistors and capacitors in series.
- xii) The radiation pattern of a spiral antenna consists of
- unidirectional maximum lobe perpendicular to antenna plane
 - unidirectional maximum lobe parallel to antenna plane
 - bidirectional maximum lobe perpendicular to antenna plane
 - bidirectional maximum lobe parallel to antenna plane.
- xiii) The troposcatter communication is used at
- UHF and VHF
 - LF
 - HF
 - VLF.

GROUP – B

(Short Answer Type Questions)

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

- How the RF characteristics of millimetre-wave IMPATTs embedded in a resonant cap waveguide structure can be measured ?
- Write short note on any *one* of the following :
 - Double drift Lo-Hi-Lo IMPATT
 - Frequency chirping in pulsed IMPATT.
- Why are directional couplers called 3dB couplers ? Define coupling factor and directivity of directional coupler. Write down the S-matrix of a directional coupler.
- What is the condition for axial mode of operation of a helical antenna ? Draw the radiation pattern of a helical antenna operating in axial mode and discuss its characteristics.
- What are the advantages of Rotary-vane attenuator over flap attenuator ? What are the functions of the fixed card at the input side of Rotary-vane attenuator ?



GROUP - C

(Long Answer Type Questions)

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

7. Compare the high-frequency performance of IMPATT, MITATT and TUNNET diodes. Obtain an expression for the current multiplication factor of a MITATT device. 10 + 5
8. Explain TRAPTT mode of oscillation in a $p^+ n n^+$ device structure. What is an avalanche shock front ? Draw the current and voltage waveforms of TRAPATT oscillator and explain the same. Draw the structure, electric field and energy band diagram of a BARITT diode. Write down the expression for this voltage. 10 + 5
9. What are Ferrites ? What do you mean by Faraday rotation ? Discuss the principle of operation of a Faraday rotation isolator. 10 + 5
10. a) What is log periodic dipole antenna array ? Define its scale factor and spacing factor.
b) Design a log periodic array having directivity of 8.5 dB, scale factor 0.895 and spacing factor 0.166 over a frequency range of 10 MHz to 30 MHz. 10 + 5
11. Obtain Friss transmission formula for a wireless system. What is EIRP ? Discuss the function of a troposcatter system in connection with troposphere propagation. 10 + 5

=====