



Name :

Roll No. :

Invigilator's Signature :

CS/M.TECH (ECE)/SEM-2/MCE-204-D/2012

2012

MICROWAVE MEASUREMENT TECHNIQUES

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.*

Question no. 1 and any *four* questions from the rest.

1. Answer any *seven* of the following : $7 \times 2 = 14$

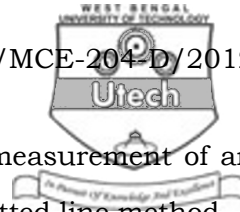
- a) Why do we need the testing of electronic components ?
- b) Why characteristic impedance of 50Ω is usually selected as RF line Z_0 ?
- c) Compare between the linear versus non-linear behavior of a device.
- d) What are the advantages of using the S-parameters to explain and RF circuit ?
- e) What are the differences between spectrum analyser and network analyser ?
- f) Comment on dynamic range and accuracy of a network analyser.
- g) Explain the significance of resolution bandwidth of a spectrum analyser.

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- h) What is tracking generator ? What is its significance in spectrum analysis ?
 - i) Describe the principle of wave meter in microwave frequency measurement.
 - j) Define the advantages of FFT Analyser.
2. a) Explain the principle of unknown impedance measurement in RF/microwave frequency range.
- b) Describe with suitable block diagram, the technique of unknown impedance measurement by the method of short circuit minima shift.
- c) Briefly explain the resonance methods of impedance measurement. 4 + 5 + 5
3. a) Illustrate the challenges in radio frequency impedance measurement.
- b) Explain with suitable schematic diagram, the method of unknown impedance measurement using magic-tee in microwave frequency range.
- c) Briefly describe the role of different T-networks in RF impedance measurements. 5 + 4 + 5



4. a) Explain the technique of frequency measurement of an unknown microwave source using slotted line method.
- b) Describe with suitable block diagram, the electronic methods of frequency measurement with special emphasis on transfer oscillator technique. 7 + 7
5. a) Explain why power is treated as more meaningful, directly measurable parameter than voltage in microwave frequency range.
- b) Describe the method of microwave power measurement using bridge circuits and find out the expression of bridge sensitivity.
- c) Illustrate the important considerations involved in the choice of suitable detectors for power measurement. 5 + 5 + 4
6. a) Illustrate the different sources of non-linearity in calibration in direct reading bridges for power measurement where linearity is extremely desirable.
- b) Describe the principle and method of high power measurement in microwave frequency range. 7 + 7



7. a) Explain with suitable block diagram, the operations of a super heterodyne type spectrum analyser. 7 + 7
- b) Describe the advantages and disadvantages of super heterodyne type spectrum analyser.
8. a) Why do we need for both magnitude and phase measurement to characterise an electronic device.
- b) Define the principle of measurement of S-parameters using a vector network analyser.
- c) Explain the working principle of a generalized network analyser with suitable block diagram. 3 + 4 + 7
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