Unit V

MICROWAVE MEASUREMENTS

PART A

1. What do you mean by slotted line?

Slotted line is fundamental tool for microwave measurements. Slotted line consists of a section of waveguide or coaxial line with a longitudinal slot. The slot is roughly 1mm wide and allows an electric field probe to enter the waveguide for measurement of the relative magnitude of field location of the probe.

2. What is the main purpose of slotted section with line carriage?

1. For determination of location of voltage standing wave maxima and minima along the line.
2. Measure the VSWR and standing wave pattern.
3. Wavelength.
4. Impedence.
5. Reflectioncoeffient.
6. Return loss measurement.

3. What is a VSWR meter?

VSWR meter is a highly sensitive, high gain, high theta, low noise voltage amplifier tuned normally at fixed frequency of 1KHZ of which microwave signals modulated. This meter indicates calibrated VSWR reading fir any loads.

4. How will you determine the vswr and return loss in reflecto meter method?

The voltage ratio between port3 or port4 is known reflectin coefficient (T) determined we determine VSWR and return loss as

$$VSWR=(1+T)/(1-T)$$
$$\text{Return loss}=-20\log(T)$$

5. List the different types of Impedance measurement methods?
1. Slotted line method
2. Reflectometer method
3. Reactor discontructer method

6. How do you measure microwave frequency?
1. Wave meter method
2. Slotted line method
3. down conversion method

7. What is a wave meter?

It is a device used for frequency measurement in microwave. It has cylindrical cavity with a variable short circuit termination .It changes the resonant frequency of cavity by changing cavity length.

8. How the S-parameter of a microwave circuit measured?

S-parameters are conveniently measured using the decamps method which utilizes the measured value of complex input reflection coefficient under a number of a reactive terminations.

9. Name two methods to measure impedance.

(i) Slotted Line
(ii) Reflecto meter

10. What are the methods to detect micro power?

(i) Bolometer
(ii) Calorimeter

11. Define microwave sensor.

The microwave power meter consists of a power sensor, which converts the microwave power into heat energy. The corresponding temperature rise provides a change in the electrical parameters resulting in an output current in the low frequency circuitry and indicates the power.

12. Mention the sensors used for microwave power measurements.

The sensors used for microwave power are the schottky barrier diode, bolometer and the thermocouples whose resistance changes with the applied power.

13. Define bolometer.

A bolometer is a power sensor whose resistance changes with temperature as it absorbs microwave power.

14. What are the drawbacks of using power meter with single bridge?

1) The changes of resistance due to mismatch at the microwave input port result in incorrect reading

2) The thermistor is sensitive to changes in the ambient temperature resulting in false reading.

15. What are the classifications of power measurements?

(i) Low power (Less than 10mW)

(ii) Medium Power (from 10mW to 10W) (iii)High power (>10W)

16. What is the drawback of using power meter with single bridge?

The change resistance due to mismatch at the microwave input port results in incorrect reading. The thermistor is sensitive to changes in the ambient temperature resulting in false reading.

17. What is calorimeter indirect heating method?

In the calorimeter indirect heating method, heat is transferred to another medium before measurement.

18. What is calorimeter direct heating method?

In the calorimeter direct heating method, the rate of production of heat can be measured by observing the rise in the temperature of the dissipating medium.

Part B

1. Explain in detail power detecting elements?
2. Explain the different types of impedance measurement methods?
3. Explain about attenuation measurement in detail.
4. Explain how low VSWR can be measured using a microwave bench.
5. Explain frequency and wavelength measurement with neat diagram?
6. Explain about power meter using double bridge?