PART – A   (10×2=20 Marks)

1. What are the limitations in measuring Z, Y and ABCD parameters at microwave frequencies.

2. Write down the merits and demerits of microwave frequency over lower frequencies.

3. Define unconditional stability with regard to microwave transistor amplifier.

4. Draw any two matching networks used in microwave frequencies.

5. Which has lesser coupling in the following ?

    i)   3 dB coupler

    ii) 6 dB coupler

    iii) 10 dB coupler.

6. What are ferrites and write its properties. Give some examples of ferrite devices.

7. What is the purpose of slow wave structures used in TWT amplifiers ?

8. What do you mean by O type tube ? Name some O type tubes.

9. Define return loss and insertion loss in RF networks.

10. What are the uses of network analyzer ? What are the types of network analysers ?

PART – B   **(5×16=80 Marks)**

11. a) The S-parameters of a two-port network are given by $S_{11} = 0.2 \lfloor 90°$, $S_{22} = 0.2 \lfloor 90°$ $S_{12} = 0.5 \lfloor 90°$, $S_{21} = 0.5 \lfloor 0°$.
    a) Determine whether the network is lossy or not.
    b) Is the network symmetrical and reciprocal
    c) Find the insertion loss of network
    d) Find the return loss at Port 1 when Port 2 is short circuited.

(OR)

b) i) Derive the S-matrix of multiport network and explain the properties of S matrix.   **(12)**
   ii) Write the property of S-matrix.   **(4)**

12. a) An RF amplifier has the following S-parameters. $S_{11} = 0.3 \angle -70°$, $S_{21} = 3.5 \angle 85°$, $S_{12} = 0.2 \angle -10°$ and $S_{22} = 0.4 \angle -45°$. Furthermore, the input side of the amplifier is connected to a voltage source with $V_s = 5V \angle 0°$ and source impedance $Z_s = 40\,\Omega$. The output is utilized to drive an antenna which has an amplifier of $Z_L = 73\,\Omega$. Assuming that the S-parameters of the amplifier are measured with reference to a $Z_0 = 50\,\Omega$ characteristics impedance. Find the transducer gain G_T, unilateral transducer gain G_{TU}, available gain G_A, Operating gain G.   **(16)**

(OR)

b) Discuss the following :
   i) Single stub impedance matching.   **(8)**
   ii) Double stub impedance matching.   **(8)**

13. a) Discuss the following :   **(8+8)**
    i) Quarter wave transformer   ii) Gunn diode oscillator.

(OR)

b) Derive the S-matrix of hybrid Tee and discuss the properties and applications. **(16)**

14. a) Explain the operation of reflex klystron oscillator with neat diagram. Write the performance characteristics and applications of the reflex klystron.

(OR)

b) Write a detailed notes on the following :
   i) Travelling wave tube amplifier.   **(8)**
   ii) Cylindrical magnetron.   **(8)**

15. a) i) Explain the principle of operation of VSWR meter.   **(8)**
    ii) Discuss the measurement of power at microwave frequency in detail.   **(8)**

(OR)

b) i) Discuss the slotted line method of impedance measurement.   **(8)**
   ii) Explain how low VSWR can be measured using a microwave bench.   **(8)**