Passive and Active microwave Devices

1.	What is S-Matrix ? Why Scattering parameters are used for higher frequencies? Discuss the properties of S parameters of microwave devices in brief.
2.	What is Reciprocal network? Draw and explain E-Plane Tee with its S-Matrix
3.	Explain the coupling factor and directivity of the four ports directional coupler. Also derive the S-matrix for completely matched four-port directional coupler. Define coupling factor, directivity, isolation of Directional coupler and write expression for each.
4.	Draw schematic of four port circulator and explain its working.
5.	Write a short note on Two Cavity Klystron. or Explain the construction and working of Two Cavity Klystron. What will happen when additional cavities are inserted between the buncher and catcher cavities?
6.	Explain construction, characteristic and application of Gunn diode.
7.	What do you understand by avalanche transit time effect? Explain working, construction, and applications of TRAPATT device.
8.	Describe the working of a reflex klystron. Using Apple gate diagram explain how velocity and current modulation takes place in reflex klystron. Differentiate between klystron and travelling wave tube.
9.	What are the problems associated to conventional tubes at microwave frequencies? Explain high frequency limitations of conventional tubes.
10.	Explain the tunnel diode characteristics with the aid of energy band diagram.
11.	Describe the construction and working of Magic tee. What are its applications Explain any one application in detail. or Derive s-parameter matrix for the E-H-plane Tee/Hybrid Tee/Magic Tee under the condition that all four ports are matched. Draw necessary diagrams.
12.	What is Gunn effect? Explain Gunn effect using two valley theory. Also explain in brief Gunn Oscillator.
13.	What are the slow wave structures? Define slow wave structure of TWT using any three structures. Explain Travelling Tube Amplifier (TWT). Also explain how helix type TWT achieves amplification.
14.	Explain cavity magnetron or crossed field device with detailed mechanism of oscillations. Why strapping is done in magnetron?
15.	Describe the applications of the parametric amplifier. Discuss the equations of power gain, noise figure and bandwidth of negative resistance parametric amplifier.
16.	Explain PIN diode and Schottky Barrier Diode in brief.
17.	Mentioned the symbol and schematic diagram of microwave circulator. Explain the working of the same using geometry containing two magic tee and one phase shifter along with its simplified s-matrix.
18.	Briefly explain 1. Waveguide Flanges 2. Waveguide Bends and Twists 3. Waveguide Corners 4. Tapers 5. Resonators
19.	Explain Hybrid Ring/Rate Race Junction Write S-matrix of Hybrid Ring.
20.	Draw and explain H-Plane Tee with its S-Matrix.