

- Q.2** a. A certain transmission line has a characteristic impedance of $75 + j0.01 \Omega$ and is terminated in a load impedance of $70 + j50 \Omega$. Compute reflection coefficient and transmission coefficient. (7)
- b. List the drawbacks of single-stub matching. (4)
- c. A Lossless transmission line with characteristic impedance 500 ohm is excited by a signal of voltage $10\angle 0^\circ$ volts at 1.2 MHz. If the line is terminated by Z_L at a distance 1 km, calculate input impedance of open circuit line and input impedance of short circuit line. (5)
- Q.3** a. Bring out the similarities and dis-similarities between waveguide and 2-wire transmission line. (8)
- b. Derive the wave equation for a TE wave. (8)
- Q.4** a. Derive an expression for resonant frequency f_0 in a rectangular cavity resonator. (6)
- b. A circular waveguide has a radius of 3 cms and is used as a resonator for TM_{011} mode at 10 GHz by placing two perfectly conducting plates at its two ends. Determine the minimum distance between the two end plates for resonance. (6)
- c. Explain Loop coupling and aperture coupling. (4)
- Q.5** a. Prove that it is impossible to construct a perfectly matched, lossless reciprocal three-port junction. (6)
- b. In a H-plane T-junction, compute power delivered to the loads 40 ohm and 60 ohm connected to arm 1 and 2 when 10 mw power is delivered to the matched port. (6)
- c. Explain how, magic-tee can be used as a balanced microwave mixer. (4)
- Q.6** a. Write short notes on waveguide bend corners and twists. (8)
- b. A symmetric directional coupler with infinite directivity and a forward attenuation of 20 dB is used to monitor the power delivered to a load Z_L . If Bolometer1 introduces a VSWR of 2.0 on arm 4. Bolometer 2 is matched to arm 3. If Bolometer1 reads 8 mw and Bolometer2 reads 2 mw, find the amount of power dissipated in Z_L . (8)
- Q.7** a. Discuss the high frequency limitation of conventional tubes. (8)
- b. By carrying out detailed mathematical analysis for reflex klystron, obtain the expression for maximum power output. (8)

- Q.8** a. Explain in detail the operation of PIN diode. **(6)**
- b. A negative resistance parametric amplifier has a signal frequency of 2 GHz, pump frequency of 12 GHz, output resistance of signal generator of $1\text{ K}\Omega$. Determine (i) Power gain in dB (ii) Power gain if it work as USB converter. **(6)**
- c. Write a short note on varactor diode. **(4)**

- Q.9** a. A typical SI BARITT diode has the following specifications.
 Relative dielectric constant = 12.5
 Donor concentration = $3.2 \times 10^{22} / \text{m}^3$
 Length = $8\ \mu\text{m}$
 Calculate (i) Critical voltage (ii) breakdown voltage (iii) breakdown electric field. **(8)**
- b. Mention the performance characteristics, applications and disadvantages of MASERS. **(8)**