5E1395

B.Tech. V- Semester (Main) Examination, Nov. 2019
PCC/PEC Electronics and Comm. Engg.
5EC 4-05 Microwave Theory and Techniques

Time : 3 Hours

Maximum Marks : 120
Min. Passing Marks : 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of Seven from Part B and Four questions out of Five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory

(10×2=20)

ersahilkagyan.com

1. Define microwave.

2. Define TE mode for microwave transmission.

3. Draw the microstrip line structure.

4. Write down the S - matrix for a two port network.

5. Define coupling factor of a directional coupler.

6. Draw the energy band diagram of a Gunn diode.

7. Define transducer power gain for microwave amplifier.

8. Why do we require measuring VSWR in a microwave circuit?

9. Write down use of Network Analyzer.

10. What do you understand by monolithic microwave integrated circuits.

PART - B

(Analytical/Problem solving questions)

Attempt any five questions

(5×8=40)

1. Describe the losses associated with microwave transmission.

2. A microstrip line is to be designed and its specification is strip thickness $t \leq 0.005h$; substrate board is alumina; relative dielectric constant $\epsilon_r = 10$; ratio of $w/h = 0.95$; Calculate

   a) effective relative dielectric constant

   b) characteristics impedance Z_0.

3. A shunt impedance Z is connected across a transmission line with characteristics impedance Z_0. Find the S - Matrix of the junction.

4. Prove that it is impossible to construct a perfectly matched, lossless, reciprocal three - port junction.

5. Explain in detail the analytic approach to optimum oscillator design using S - Parameters.

6. Explain the experimental set - up for measurement of radiation pattern and beam width.

7. Draw the block diagram of a basic radar and explain how it works.

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any Four questions   (4×15=60)

1. The S - parameters of a two - port network are given by

   $S_{11} = 0.2\angle 0, \ S_{22} = 0.1\angle 0$

   $S_{12} = 0.6\angle 90°, \ S_{21} = 0.6\angle 90°$

   a) Prove that the network is reciprocal but not lossless.

   b) Find the return loss at port 1 when port 2 is short circuited.

2. Explain the velocity modulation and bunching process in two - cavity klystron. Also derive the expression for bunching parameters.

3. Design a low - pass, maximally flat lumped - element fitter having a passband of 0-2 GHz, and an attenuation of at least 20dB at 3.4 GHz. The characteristics impedance is 50Ω.

4. Describe the method of frequency and impedance measurement at microwave frequency.

5. a) Describe the process involved in fabrication of MMICs.

   b) Write down the medical and civil applications with suitable diagram of microwaves.

   c) Write short notes on microwave imaging.