USN | | | | | | | | | | |

10EC54

Fifth Semester B.E. Degree Examination, July/August 2021
Microwaves and Radar

Time: 3 hrs. Max. Marks:100

Note: **1.** ***Answer any FIVE full questions.***
2. ***Use of Smith Chart is permitted.***

1 a. Starting from the fundamentals, derive an expression for the voltage and current at any point on the transmission line. **(10 Marks)**

b. A load impedance of $Z_R = 60 - j80\Omega$ is required to be matched to a 50Ω co-axial line, by using a short circuited stub of length 'L' located at a distance "d" from the load. The wavelength of operation is 1 meter. Using Smith chart, find "d" and "L". **(10 Marks)**

2 a. With a neat diagram, explain the working of a two-hole directional coupler. Also derive the scattering matrix of the same. **(10 Marks)**

b. Explain the construction, working and application of an isolator based faraday rotation with a neat diagram. **(10 Marks)**

3 a. With neat sketches, explain the IMPATT diode and draw the negative resistance curve. **(10 Marks)**

b. Explain with a neat diagram, the construction and working of PIN diode and Schottky barrier diode. **(10 Marks)**

4 a. Explain S-matrix representation of multi-port network and also explain the properties of S-matrix. **(10 Marks)**

b. Starting from the impedance matrix equation, prove the symmetry property of a reciprocal network. **(10 Marks)**

5 a. With a neat diagram, explain the working of E-plane Tee junction. Also derive the scattering matrix. **(10 Marks)**

b. Explain the phase shifter with neat sketches. **(10 Marks)**

6 a. Explain the construction of a parallel strip lines with a neat schematic diagram. State equations of distributed parameters of this line. **(08 Marks)**

b. With necessary equations, explain various losses in Microstrip lines. **(08 Marks)**

c. A shielded strip line has the following parameters:
Strip width W = 63.5 mm; strip thickness t = 35 mm, shield depth d = 180 mm, dielectric constant ε_r = 2.56. Calculate: (i) The characteristics impedance of the line (ii) The fringe capacitance **(04 Marks)**

7 a. Derive the simple form of the radar range equation, starting from the power density of isotropic antenna. **(08 Marks)**

b. With a neat block diagram, explain the conventional pulse radar with a super heterodyne receiver. **(08 Marks)**

c. State and briefly explain the applications of RADAR. **(04 Marks)**

8 a. With a neat block diagram, explain the principle and working of an MTI Radar. **(08 Marks)**

b. Explain single delay-line canceller and frequency response of the single delay-line canceller, and also obtain the expression for blind speeds. **(08 Marks)**

c. Briefly explain the advantages offered by digital MTI processing. **(04 Marks)**

* * * * *

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

C.M.R. INSTITUTE OF TECHNOLOGY CMR BANGALORE
VTU-06-09-2021 08:51:08am - CR - CR - CR