

--	--	--	--	--	--	--	--	--	--



Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Microwave and Radar

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO full questions from each part.

PART – A

- 1 a. Derive an expression for the line impedance of a transmission line, at the sending end, in terms of load impedance (Z_l) and characteristic impedance (Z_0). (08 Marks)
- b. Define and derive expressions for reflection co-efficient and transmission co-efficient for a transmission line. (08 Marks)
- c. A transmission line has following parameters:
 $R = 2\Omega/m$ $G = 0.5\text{m mho/m}$ $f = 1\text{GHz}$ $L = 8\text{nH/m}$ $C = 0.23\text{pF}$
 Find: i) Characteristic impedance ii) Propagation constant. (04 Marks)
- 2 a. Derive electric and magnetic field equations in rectangular waveguides for TM_{mn} mode. (10 Marks)
- b. Define coupling factor, directivity of a directional coupler. Explain two hole directional coupler. (10 Marks)
- 3 a. Explain the fundamental concept of Ridley Watkins-Hilsum (RWH) theory. Derive an expression for the condition for negative resistance in the Gunn diode, with the help of two-valley model. (10 Marks)
- b. Draw equivalent circuit of the parametric amplifier. Explain briefly parametric up converter. (06 Marks)
- c. An n-type GaAs Gunn diode has following parameter:
 i) Electron density $n = 10^{18} \text{ cm}^{-3}$
 ii) Electron density at lower valley : $n_l = 10^{10} \text{ cm}^{-3}$
 iii) Electron density at upper valley $n_u = 10^8 \text{ cm}^{-3}$
 iv) Temperature $T = 300^\circ\text{K}$
 Determine the conductivity of the diode. (04 Marks)
- 4 a. State and derive properties of S-parameters. (10 Marks)
- b. Define the following losses in microwave network in terms of S-parameters:
 i) Insertion loss
 ii) Transmission loss
 iii) Reflection loss
 iv) Return loss. (06 Marks)
- c. Write S-matrix for
 i) Directional coupler
 ii) Four port circulator. (04 Marks)

PART – B

- 5 a. Write short note on coaxial connectors and adapters. (05 Marks)
- b. Explain construction and working of a precision rotary type phase shifter, with neat diagram. (10 Marks)
- c. Explain magic tee with neat diagram. (05 Marks)



- 6 a. With necessary equations, explain various losses in microstrip lines. (06 Marks)
- b. With a neat sketch, explain the different types of strip lines. (10 Marks)
- c. Compare strip-line and microstrip line. (04 Marks)

- 7 a. Explain RADAR with neat block diagram. (06 Marks)
- b. State and explain applications of RADAR. (06 Marks)
- c. Derive an expression for the basic form of RADAR-RANGE equation. (08 Marks)

- 8 a. Explain the principle and working of MTI RADAR with the help of a neat block diagram. (06 Marks)
- b. Explain single delay line canceller with neat block diagram. Derive an expression for the frequency response of a delay line canceller. (08 Marks)
- c. For an MTI RADAR, what are the first three blind speed at 2GHz when PRF is at 1kHz. (06 Marks)

* * * * *