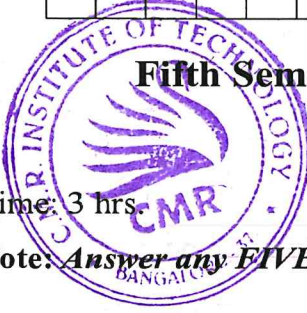


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Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
Microwave and Radar

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:
 $R = 2\Omega/m$ $G = 0.5m \text{ mho/m}$ $f = 1\text{GHz}$ $L = 8nH/m$ $C = 0.23pF$
 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)

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