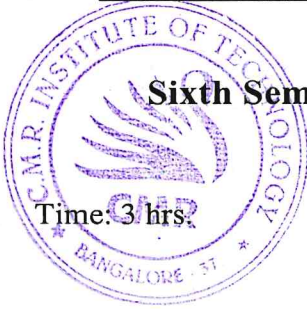


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10TE64



Sixth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Microwave & Radar

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Derive transmission line equations by the methods of distributed circuit theory. (09 Marks)
- b. Define reflection coefficient and derive an expression for reflection coefficient at the load in terms of load impedance. (05 Marks)
- c. A load impedance of $Z_L = 60 - j80 \Omega$ is required to be matched to a 50Ω coaxial line by using a short circuit stub of length 'l' and a distance 'd' from the load. The wavelength is 1 m. Determine the position and length of the stub. Use Smith chart. (06 Marks)
- 2 a. Briefly explain the following microwave devices :
 - (i) Hybrid ring
 - (ii) Two hole directional coupler. (10 Marks)
- b. Write field components of TE_{10} mode inside a rectangular waveguide. Using this, derive the equation for power transmitted through the guide for the dominant mode in z-direction. (10 Marks)
- 3 a. Explain construction and operation of Gunn diode in the Gunn mode and LSA mode. (10 Marks)
- b. With neat diagram, explain the construction operation of IMPATT diode and mechanism of oscillations. (10 Marks)
- 4 a. What are the advantages of [S] matrices over [Z] matrices? (06 Marks)
- b. List the common properties for [S] and [Z] matrices. (04 Marks)
- c. Define insertion loss, transmission loss, return loss in terms of S-parameters. (10 Marks)

PART – B

- 5 a. With a neat diagram, explain the working of precision type phase shifter. (10 Marks)
- b. With a neat diagram, explain the working of a H-plane Tee junction. Also derive the S-matrix. (10 Marks)
- 6 a. Explain the construction and field pattern for microstrip line. (06 Marks)
- b. Discuss the different losses in a microstrip line. (08 Marks)
- c. Compare strip line and microstrip line. (06 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.

- 7 a. Define following terms related to RADAR : (i) Range to a RADAR (ii) Maximum Unambiguous range. (04 Marks)
- b. Derive the expression for the simple form of the maximum range of radar. Comment on radar range equation. (08 Marks)
- c. State and briefly explain applications of RADAR. (05 Marks)
- d. A 10 GHz RADAR has the following characteristics :
Peak transmitted power = $P_t = 250$ kW ;
Peak gain of antenna = $G = 2500$;
Minimum detectable peak signal power by the receiver = $S_{\min} = 10^{-14}$ w
Radar cross section of the target = $\sigma = 2$ m²
Cross sectional area of the radar antenna $A_e = 10$ m²
Find the maximum range (R_{\max}) possible. (03 Marks)
- 8 a. With the aid of a block diagram, explain fully the operation of an MTI radar system using a power amplifier in the transmitter. (12 Marks)
- b. What is Doppler effect? (04 Marks)
- c. What are the advantages offered by digital MTI processing? (04 Marks)
