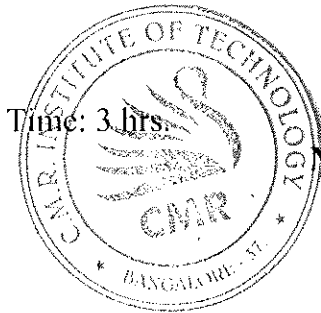


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Sixth Semester B.E. Degree Examination, June/July 2016

Microwaves and Radar



Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Use of Smith chart is permitted.

PART – A

- 1 a. Define reflection coefficient. Derive the equation for reflection coefficient at the load end and at a distance 'd' from load end, starting from equation for Z_L . (10 Marks)
- b. A load of $73 - j80$ ohms is required to be latched to 50 ohm coaxial line having operating wavelength $\lambda = 30$ cm, using a short circuited shunt stub. Determine the position and length of the stub. (10 Marks)
- 2 a. Derive the relevant equations for the propagation of TE waves in a rectangular waveguide and explain how dominant mode is obtained. (12 Marks)
- b. What is a directional coupler? Explain the working of two hole directional coupler. (08 Marks)
- 3 a. Explain the modes of operation for Gunn diode. (10 Marks)
- b. Explain parametric up converter with necessary equations for gain, noise figure and band width. (10 Marks)
- 4 a. What is a reciprocal network? For a reciprocal microwave N port network, prove that the admittance and impedance matrices are symmetrical. (07 Marks)
- b. State and prove the following properties of S-parameters:
 - i) Symmetrical property for reciprocal network.
 - ii) Unitary property for a lossless junction. (08 Marks)
- c. The S-parameters of a two network are given by $S_{11} = 0.2 \angle 0^\circ$, $S_{22} = 0.1 \angle 0^\circ$, $S_{12} = 0.6 \angle 90^\circ$ and $S_{21} = 0.6 \angle 90^\circ$. Is the network reciprocal? Lossless? (05 Marks)

PART – B

- 5 a. Explain construction and working of a precision rotary type phase shifter, with neat diagram. (08 Marks)
- b. In a H-plane T junction compute the power delivered to the loads 40 ohms and 60 ohms connected across arms 1 and 2 when 10 mW power is delivered to the matched port 3. (Assume $Z_0 = 50$ ohms). (07 Marks)
- c. Explain working of Magic Tee as balanced microwave mixer. (05 Marks)
- 6 a. Explain the operation of micro strip line with its structure and Quasi TEM mode field distribution. (07 Marks)
- b. With a neat diagram, explain the operation of parallel strip line. And also write the expressions for distributed parameters of parallel strip line; characteristic impedance and attenuation of the same. (07 Marks)
- c. A certain shielded strip line has $w = 63.5$ mm, $t = 35$ mm and $d = 180$ mm. It has a permittivity of 2.56. Compute its characteristic impedance, K factor and Fringe capacitance. (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. Derive the radar range equation. Discuss the effects of each parameter on the maximum detection range of the radar. (08 Marks)
- b. Explain Doppler frequency shift for moving targets. (07 Marks)
- c. A marine radar operating at 10 GHz has a maximum range of 50 km. With an antenna gain of 4000. The transmitter has a power of 250 KW and a minimum detectable signal of 10^{-11} Watts. Determine the cross section of the target the radar can sight. (05 Marks)
- 8 a. Explain the principle and working of moving target indicator radar, with the help of a block diagram. (10 Marks)
- b. Write brief notes on:
- i) Blind speed
 - ii) Delay line canceller (10 Marks)

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