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10EC54

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
Microwaves and Radar

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Use of Smith charts is permitted.

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.

PART – A

1 a. Derive expressions for attenuation constant, phase constant, characteristic impedance and phase velocity of a transmission line used at microwave frequencies. **(10 Marks)**

b. A certain transmission line has a characteristic impedance of $75 + j0.01\Omega$ and is terminated in a load impedance of $70 + j50\Omega$.
Compute : i) The reflection coefficient ii) The transmission co-efficient. **(06 Marks)**

c. Describe single–stub matching section. **(04 Marks)**

2 a. Derive $TE_{m,n}$ field equations in a rectangular wave guide. **(10 Marks)**

b. Define dominant mode, in a rectangular wave guide. **(03 Marks)**

c. Justify : An ideal isolator is a non-reciprocal transmission device. **(07 Marks)**

3 a. Explain R-W-H theory of a Gunn diode. **(07 Marks)**

b. What are Gunn domains? **(03 Marks)**

c. State and explain properties of S-parameters for junction ports having common characteristic impedance. **(10 Marks)**

4 Write note on :

a. PIN diode **(07 Marks)**

b. Parametric amplifier **(08 Marks)**

c. Microwave Coaxial Connectors. **(05 Marks)**

PART – B

5 a. With the aid of suitable diagram, explain the operation of magic-tee. What are its applications? **(10 Marks)**

b. With the aid of neat diagram, describe the working of a phase shifter. **(06 Marks)**

c. Describe microwave attenuators. **(04 Marks)**

6 a. What are the advantages and drawbacks of micro strip lines? **(05 Marks)**

b. A loss less parallel strip, line has a conducting strip width 'w'. The substrate dielectric between the two conducting strip has a dielectric constant $\varepsilon_{r_d} = 6$. Thickness of line=d=4mm.
Calculate :
i) The required width w of the strip line in order to have characteristic impedance of 50Ω
ii) The strip line capacitance
iii) The strip line inductance
iv) Phase velocity of the wave in the line. **(10 Marks)**

c. Write a brief note on coplanar strip lines. **(05 Marks)**

7 a. Discuss different applications of a Radar. **(07 Marks)**

b. Derive the basic radar range equation as governed by minimum receivable echo power. **(10 Marks)**

c. Define PRF. **(03 Marks)**

8 a. What is Doppler effect? **(04 Marks)**

b. Describe MTI radar, given an instance of MTI cannot be used. **(10 Marks)**

c. Describe digital MTI processing. **(06 Marks)**

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