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06EC54

Fifth Semester B.E. Degree Examination, December 2011
Microwaves and Radars

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. Use of Smith chart is permitted.
3. Assume any missing data.

PART – A

1 a. What are standing waves? Draw the standing wave pattern for :
i) Open circuit termination ii) Short circuit termination iii) Matched termination **(06 Marks)**

b. What is distortionless line? State the conditions for a line to be distortionless. **(06 Marks)**

c. The primary line constants of a transmission line per km are specified as R = 42.9 Ω, L = 0.7 mH, G = 2.4 μ℧, C = 0.1 μF. Calculate Z_o, α, β and V_P, if w = 5000 radians/sec. **(08 Marks)**

2 a. Determine the input impedance of 200 Ω line 3/8 wavelength long terminated in a 100 Ω resistance using Smith chart and write procedural steps. **(10 Marks)**

b. Explain the principle and working of Faraday's rotation isolator. **(10 Marks)**

3 a. Explain the application of PIN diode as single switch and as phase shifter. **(10 Marks)**

b. Explain parametric up converter with necessary equations for gain, noise figure and bandwidth. **(10 Marks)**

4 a. For a two port network, explain S parameters and properties of S parameters. **(10 Marks)**

b. Explain RWH theory and modes of operation Gunn diode. **(10 Marks)**

PART – B

5 a. Explain the properties of magic Tee and mention its application. **(10 Marks)**

b. Write the equations for ϵ_{eff} and Z_o for $\frac{w}{h} >> 1$ and $\frac{w}{h} << 1$ for a micro strip line. **(05 Marks)**

c. A micro strip line has the following parameters :
$\epsilon_r = 5.23$, h = 7 mils, t = 2.8 mils, w = 10 mils.
Calculate the characteristic impedance of the line. **(05 Marks)**

6 a. Explain the principle and working of precision type variable attenuator. **(08 Marks)**

b. Explain the following with respect to radar system :
i) Maximum unambiguous range ii) Clutter attenuation
iii) Improvement factor iv) Doppler shift. **(08 Marks)**

c. A target is closing on a radial of a radar with a relative velocity of 200 knotts. Radar transmits with a wavelength of 5cm. Find the Doppler shift of the target. **(04 Marks)**

7 a. What is blind speed? Derive the equation. **(05 Marks)**

b. Explain with a block diagram, the working of a digital MTI processor used in radar system. **(10 Marks)**

c. A pulse radar having pulse width of 5μs and at PRF of 100 Hz, find maximum unambiguous range and range resolution. **(05 Marks)**

8 a. What are filter banks? Explain unmarking of moving target from the moving clutter using filter banks. **(03 Marks)**

b. Explain the spectrum of high p_{rf} airborne radar systems. **(07 Marks)**

c. A CW radar is operating at p_{rf} of 1 kHz and is having wavelength of 2 cm. Find first and second blind speed. **(10 Marks)**

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