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# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

*A Constituent Institution of Manipal University*

**SEVENTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION**
**NOV 2017**
**SUBJECT: MICROWAVE INTEGRATED CIRCUITS (ECE - 441)**

**TIME: 3 HOURS** **MAX. MARKS: 50**

**Instructions to candidates**

- Answer **ANY FIVE** questions.
- Missing data may be suitably assumed.

1A. Design a rectangular microstrip antenna using a substrate with dielectric constant $\varepsilon_r = 3.2$, substrate height $h = 1.6cm$ , so as to resonant at 1.5GHz, and compare the Physical and effective length of patch antenna.

1B. What is Isolator? What are the applications of it? How the modes of waves are changes in it?

1C. What is gyromagnetic resonance? and explain its resonance frequency.

(5+3+2)

2A. Design a three pole microstrip low pass filter in chebyshev response for the given parameters ,dielectric Constant $\varepsilon_r = 10.2,$ substrate height $h = 1.27mm,$ cut off frequency $f_c = 1GHz$ .the prototype constant for a pass band ripple =0.1db are $g_0 = g_4 = 1, g_1 = g_3 = 1.0000, g_2 = 2.000.$

2B. How the frequencies are up and down converted in the microwave mixer? Explain mathematically.

2C. A transmission line has the following parameters: R=2 ohm/m, G = 0.5 mili mho/m, f = 1GHz, L = 8 nH/m, C = 0.23pf, Calculate (a) the characteristics Impedance; (b) the propagation constant.

(5+3+2)

3A. Explain the fabrication, V-I characteristics and its different mode of switching configuration of PIN Diode.

3B. What is frequency multiplier? Explain diode frequency multiplier.

3C. For a certain transmission line, the return loss for a load is observed to be equal to 18 dB. Calculate the reflection coefficient and SWR

(5+3+2)

4A. Design a microstrip high pass filter by using ditributed short circuited stubs for the given parameters n=4 , $f_c = 1.5GHz, \varepsilon_r = 2.2, h = 1.57mm,$ the admittances are

$y_1 = 0.32300, y_{1,2} = 1.07842, y_2 = 0.39443, y_{2,3} = 1.06488.$

4B. Write three relative advantages and Disadvantages of MMIC over hybrid MIC

4C. What are types of coupler? Explain its even and odd mode analysis.

(5+3+2)

5A. Explain the fabrication Method of Schottky Barrier Diode (SBD) and working principle of SBD.

5B. Explain with diagram
i) Reciprocal and Non Reciprocal Phase Shifters.
ii) Electrical length of Microstrip

5C. Explain the following: (a) Image frequency (b) Conversion Loss

(5+3+2)

6A. Determine the characteristics impedance and the effective dielectric constants for a microstrip transmission line fabricated in an alumina substrate ($e_r = 9.7$) if the ratio w/h is (i) 0.5 (ii) 5. Also find the velocity of propagation in each case.

6B. What are types of losses in transmission line? Explain any three, with mathematical equations.

6C. Explain (a) Critical coupling (b) Aperture coupled cavity

(5+3+2)