Eighth Semester B.Tech Degree Examination, April 2017

(2013 Scheme)

13.805.6 Microwave devices and circuits

Time : 3 Hours   Max marks : 100

PART- A

(Answer all questions, each carries 2 marks)

1. What you mean by degenerative mode? Explain with examples.
2. An air filled circular wave guide is to be operated at a frequency of 6GHz and is

   to have dimensions such that $fc = 0.8f$ for TE_{11} mode. Determine the diameter of

   the waveguide.

3. Explain the application of Richard's transformation in microwave filter design.
4. Why S parameters are used at microwave frequencies?
5. List the advantage of Smith chart compared with analytical method in solving transmission line problems.
6. Write the S matrix for 3 port circulator.
7. List the applications of IMPATT diode.
8. In a Gunn diode with active length of 20μm, the drift velocity of electrons is $2x10^7$ cm/s. Calculate the rational frequency and critical voltage of the diode.
9. List the application of MASER.
10. List the advantage of parametric amplifier.

PART- B

(Answer any one question from each module, each carries 20 marks)

Module-I

11. (a) Derive the equation for electric fields and magnetic fields for TE mode in circular wave guide.

    (b) Find the width for a 50Ω copper strip line conductor, with b = 0.32 cm and εr = 2.2
.   If the dielectric loss tangent is 0.001 and the operating frequency is 10 GHz,

       calculate the attenuation in dB/λ Assume a conductor thickness of t = 0.01mm.

12. (a) Derive the equation for electric fields and magnetic fields for TM mode in
        rectangular cavity resonator.
    (b) Calculate the width and length of a micro strip line for a 50Ω characteristic
        Impedence and a 90^0 phase shift at 2.5 GHz. The substrate thickness is
        d = 0.127cm, with ε_r = 2.20.

Module-II

13. (a) Match a load impedance of $Z_L = 100 + j80$ Ω to a 50 Ω line using a single series
    Open –circuit stub. Assuming that the load is matched at 2 GHz.
    (b) Explain the working ,S matrix and application of E plane and Hybrid Tee.

14. (a) Design a double-stub shunt tuner to match a load impedance $Z_L = 60 - j80$Ω

    to a 50 Ω line. The stubs are to be open circuited ,and are spaced $\lambda/8$ apart.

    (b) Explain the working, S matrix and application of directional coupler and isolator.

Module-III

15. (a) Explain the working and application of tunnel diode.

    (b) Explain the principle and characteristics of MESFET and high mobility transistor.

16. (a) Explain the working and application of TRAPATT diode.

    (b) Explain the working and application of Gunn diode

Module-IV

17. (a) Explain spontaneous emission and stimulated emission in the case of MASER and

    list the disadvantages of MASER.

    (b) Derive Manely Rowe relations for parametric amplifier.

18. (a) Explain constructional features and working of Ruby MASER.

    (b) Briefly explain parametric up converter, down converter and negative resistance

    parametric amplifier.