Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 40197

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Seventh Semester

Electronics and Communication Engineering

EC 1402 A — MICROWAVE ENGINEERING

(Regulations 2008)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   State the significance of scattering matrix representation.

2.   What is the need of load matching in two port network?

3.   Using the scattering matrix of an E or H plane tee, outline its basic properties.

4.   What is Faraday Rotation? How does it originate and what are its uses in various device?

5.   State the high frequency limitations of conventional tubes.

6.   What is mode jumping in a cavity magnetron? How this can be avoided?

7.   Draw the equivalent circuit of PIN diode and mention its applications.

8.   What is Gunn effect? Name the materials in which Gunn effect is observed.

9.   Calculate the VSWR in dB to waveguide when the load is a 3dB attenuator terminated by a short circuit.

10. Specify the features of a Network Analyzer.

PART B — (5 × 16 = 80 marks)

11. (a) (i)   A shunt impedance Z is connected across a transmission line with characteristic impedance Z_0. Find the S-Matrix of the junction.   (10)

         (ii) List and explain the properties of s-parameters.   (6)

Or

(b) (i) Derive relationship between ABCD parameters and S-parameters of a two-port network. (8)

(ii) A network has the following S-parameters. (8)

$$[S] = \begin{bmatrix} 0.1 \underline{|90°} & 0.8 \underline{|-45°} & 0 \\ 0.8 \underline{|-45°} & 0 & 0 \\ 0.3 \underline{|-45°} & 0 & 0 \end{bmatrix}$$

(1) Is this network lossless how?

(2) Is this network reciprocal? Why?

12. (a) What is the need for passive components and devices? Explain structure and function of waveguide choke flanges and coupling loops. (16)

Or

(b) Derive the scattering matrix for Magic Tee and mention its applications. (16)

13. (a) With neat diagram, explain the mechanism and modes of operation of two Cavity klystron amplifier. Derive the equation for power output and efficiency. (16)

Or

(b) A normal cylindrical magnetron has the following parameters. Inner radius. (i) 0.15 meter, outer radius (ii) = 0.45 m magnetic flux density $B_0 = 1.2$ mW/m². Determine Hull cut off voltage and determine the cut off magnetic flux density if the beam voltage Vo is 6500 V. Discuss various application of magnetron. (16)

14. (a) Discuss the mounting of IMPATT device in :

(i) Co-axial and (8)

(ii) Wave guide configuration. (8)

Or

(b) (i) What do you understand by transferred electron effect? Explain. (6)

(ii) Calculate the frequency of oscillations for a stable domain mode for a 5 μm long GaAs gunn device. What is the minimum electron concentration? (10)

15. (a) Explain the microwave power measurements using Bolometer and thermocouple. Distinguish between these two methods.

Or

(b) Why is VSWR measurement important in microwave measurements? Describe low and high VSWR measurement methods and errors possible in these methods.