Reg. No. ☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 63190

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

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. Define a reciprocal network.

2. The impedance matrix of a certain microwave circuit is $[Z] = \begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$. Determine the corresponding scattering matrix.

3. Mention the applications of circulator.

4. List the ideal characteristics of matched load.

5. Name different types of slow wave structures and state why the wave is slowed down.

6. What is mode jumping in cavity magnetron and how this is arrested?

7. Draw the V-I characteristics of PIN Diode and Varactor diode.

8. Compare IMPATT and GUNN Diode.

9. If the width of wave guide is 4 cm and the distance between two successive minima is 2 cm of a standing wave pattern formed within the wave guide, calculate the free space wave length.

10. How is calibration performed on network analyser for two-port measurements?

PART B — (5 × 16 = 80 marks)

11. (a) State and prove the unitary property of s-matrix for loss less networks. Determine the s-parameters of a series element shown below.

1 ○——— [Z] ———○ 2

1' ○——————————○ 2'
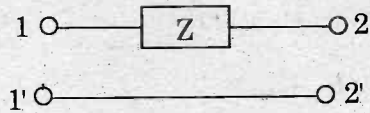
Or

(b) Derive the relation between [ABCD] matrix and [S-] matrix of a two-port network. Derive s matrix for E plane tee junction.

12. (a) Discuss the structure, Working Principle and application of the following microwave devices.

(i) Phase shiffers

(ii) Short circuit plunger

(iii) Tuning screws

(iv) E plane and H plane tees.

Or

(b) What is magic tee? A magic T is terminated at collinear ports 1 and 2 and difference ports by impedance of reflection coefficients $\Gamma 1 = 0.5$, $\Gamma 2 = 0.6$ and $\Gamma 4 = 0.8$ respectively. If 1 W power is fed at the sum port 3, Calculate the power reflected at the port 3 and power transmitted to the other three ports.

13. (a) What are the high frequency limitations of conventional tubes? Explain the structure and working of Traveling wavetube amplifier.

Or

(b) A Two cavity klystron operates at 5 GHz with a dc beam voltage of 10 KV and a 2 mm cavity gap. For a given RF voltage, the magnitude of the gap voltage is 100 volts. Calculate the transit time at the cavity gap, the transit angle and the velocity of the electrons leaving the gap.

14. (a) (i) Differentiate between IMPATT and TRAPATT diodes.

(ii) Explain the operation of GUNN diode along with its V–I characteristics.

Or

(b) (i) Describe the construction, characteristics of a PIN diode.

(ii) Explain the varacter diode operation and give its applications.

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15. (a) (i) How are microwave measurements different from the low frequency measurements? (6)

   (ii) Explain with the help of a neat diagram the various methods used for low and medium power measurements. (10)

<p align="center">Or</p>

   (b) Enumerate the following :

   (i) Impedance measurement (5)

   (ii) Frequency measurement (5)

   (iii) Measurement of cavity Q. (6)