Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 86584

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

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.   Mention the limitations in measuring Z, Y and ABCD parameters at microwave frequencies.

2.   Differentiate between symmetry network and reciprocal network.

3.   Draw the H-Plane Tee junction.

4.   A directional coupler with 20 dB is used to couple power. If the incident power is 1 mw what is the coupled power?

5.   A reflex Klystron is operating at 10 GHz with 600 V beam voltage. If the repeller voltage is 250 V, determine the optimum repelles space for $1\frac{3}{4}$ mode.

6.   Define velocity modulation.

7.   Define Gunn effect. In which materials the Gunn effect is observed?

8.   Name the applications of parametric amplifier.

9.   List the scales on a VSWR meter.

10. Enumerate the significance of Tunable detector.

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.

Or

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

12. (a) Describe with a neat sketch, the principles of operation of a 3-port circulator. Derive the S-matrix for the circulator, when all the ports are matched. Write down the S-matrices for a clockwise and a counter clockwise circulator.

Or

(b) (i) Prove that a TEE junction can not have all the three arms matched.

(ii) Explain the working of magic tee with neat sketch. (8)

13. (a) What are the high frequency limitations of conventional tubes? Explain the structure and working of Traveling wavetube amplifier. (8)

Or

(b) A Two cavity klystron operates at 5 GHz with a dc beam voltage of 10 KV and a 2mm 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) Give Manley Rowe relations regarding power flow of a non-linear reactance. How this can be used in parametric amplifier? (16)

Or

(b) Explain the operation of TRAPATT diode. Compare this with IMPATT diode in construction, operation and application. (16)

15. (a) How are microwave measurements different from low frequency measurements? Explain the double minimum methods of measuring VSWR.

Or

(b) With a neat block diagram, explain the power and impedance measurements in a microwave system.

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