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Reg. No. :

Question Paper Code : 20427

B. E./B. Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Seventh Semester

Electronics and Communication Engineering

EC 6701 — RF AND MICROWAVE ENGINEERING

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Give the X- band frequency range.
2. Define lossless network.
3. Define noise figure of a two port network.
4. Why is it necessary to go for microstrip line matching networks?
5. What is meant by phase shifter?
6. Draw the equivalent circuit of a Gunn diode.
7. How to minimize the lead inductance and inter electrode capacitance effects?
8. Distinguish between O-type and M-type tubes.
9. Compare thermistor and baretter.
10. Why direct microwave measuring instruments are not used in laboratory?

PART B — (5 × 13 = 65 marks)

11. (a) Define scattering matrix. Explain the following properties of S-matrix
    (i) Symmetry property
    (ii) Unitary property
    (iii) Phase shift property. (13)

    Or

    (b) Determine the transmission matrix of a two port network. (13)

12. (a) (i) Derive the equations for power gain, available power gain and transducer power gain. (7)

(ii) Analyze mathematically about amplifier stability. (6)

Or

(b) (i) Illustrate the design of L-matching network using smith chart. (7)

(ii) Explain constant VSWR circles. (6)

13. (a) (i) Explain the construction of Magic Tee and derive its S-matrix. (6)

(ii) Derive the scattering matrix for a directional coupler. (7)

Or

(b) (i) Describe the Gunn effect with the aid of two valley model theory. (7)

(ii) Explain with neat diagrams the fabrication process of MMIC's. (6)

14. (a) (i) Draw the schematic of two cavity Klystron amplifier and explain the process of velocity modulation and bunching. Also derive the equation of velocity modulation. (8)

(ii) With neat diagram, explain how amplification of RF wave is accomplished in Helix type TWT. (5)

Or

(b) (i) Draw the cross sectional view of Magnetron, tube and explain the process of bunching. Derive the expression for Hull cut off voltage. (7)

(ii) Compare TWT and Klystron. (6)

15. (a) (i) Draw the block diagram of a spectrum analyzer and explain its working. (6)

(ii) With neat diagram, explain the measurement of frequency using slotted line technique. (7)

Or

(b) (i) With neat diagram, explain the Impedance measurement using Reflectometer. (6)

(ii) With neat experimental set up, describe the dielectric constant measurement. (7)

PART C — (1 × 15 = 15 marks)

16. (a) A two cavity Klystron amplifier has the following specifications: (15)

Beam voltage, $V_0 = 900$ V

Beam current, $I_0 = 30$ mA

Frequency f = 8 GHz

Gap spacing in either cavity, d = 1 mm

Spacing between center of cavities, L = 4 cm

Effective shunt impedance, $R_{sh} = 49\ K\Omega$

Determine

(i) Electron velocity

(ii) dc transit time of electron

(iii) Maximum input voltage

(iv) Voltage gain.

Or

(b) A slotted line is used to measure the frequency and it was found that the distance between the nulls is 1.85 cm. Given the guide dimension as 3 cm × 1.5 cm, calculate the frequency. (15)