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Question Paper Code : 31286

29th AN

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Seventh Semester

Electronics and Communication Engineering

080290059 — MICROWAVE ENGINEERING

(Regulation 2008)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Give the ABCD matrix for a two port network.

2. A 10mW signal is applied to a 20dB directional coupler. Determine the power available at the coupled port.

3. What is velocity modulation in Klystron amplifier?

4. What is crossed field amplifier?

5. Why is the slot located at the centre of the slotted section?

6. Name two methods to measure impedance.

7. State Manley Rowe power relations.

8. Distinguish between Avalanche transit time devices and transferred electron devices.

9. State any two characteristics of ideal substrate materials.

10. What are strip lines?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Describe the need for scattering matrix formulation and obtain the S-matrix of an n-port network. (8)

(ii) Explain the phase shifting property and prove that $S'_{nn} = e^{-2j\theta n} S_{nn}$. (8)

Or

(b) (i) From the first principle derive the scattering matrix of an ideal directional coupler. (8)

(ii) A directional coupler of 10dB coupling and 40 dB directivity produces a transmission loss of 1 dB. For an input power of 10mW at the input port of the main arm, determine the power at the other ports. (8)

12. (a) (i) Draw the Electronic Admittance spiral of the Reflex klystron. With a neat diagram explain the working of a Reflex Klystron. Draw an applegate diagram to illustrate bunching. Draw the graphs of output power when used as an oscillator and frequency deviation as a function of repeller voltage and explain the graphs. (10)

(ii) The operating frequency of a Reflex Klystron is 2Ghz. Calculate the change in frequency for a 2% change in the repeller voltage.

Given

Repeller voltage = 2000V

Accelerating voltage = 500V

Space between the exit of the gap and the repeller voltage = 2 cm.

Assume that the operation is for n=1. (6)

Or

(b) (i) Distinguish between TWT and Klystron (4)

(ii) With neat diagram explain Helix type TWT and write its gain expression. What is the need for placing attenuators inside the TWT's? (12)

13. (a) Draw the schematic block diagram of a vector network analyzer and explain how it measures both amplitude and phase of a signal over a wide frequency range (16)

Or

(b) With a neat block diagram enumerate the steps involved for the insertion loss and attenuation measurements. (16)

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14. (a) (i) Discuss the RWH theory of Gunn diode. (8)

   (ii) Explain the various domains of Gunn diode characteristics and show how they are obtained. (8)

Or

   (b) (i) With neat sketches compare the performance of IMPATT and TRAPATT. (12)

   (ii) Give the principle of parametric amplifier. (4)

15. (a) (i) Write short notes on

      (1) Parallel strip lines

      (2) Shielded strip lines. (8)

   (ii) A shielded strip line has the following parameters.

   Relative dielectric constant of insulator polyethylene $\epsilon rd = 2.25$

   Strip thickness t = 0.5 mm

   Shield depth d = 4 mm.

   Calculate the

      (1) K factor

      (2) Fringe capacitance

      (3) Characteristic impedance. (8)

Or

   (b) Enumerate in detail Microstrip based broad band matching networks. (16)

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