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Question Paper Code : 41229

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

Seventh Semester

Electronics and Communication Engineering

EC 1402A — MICROWAVE ENGINEERING

(Regulation 2008)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A shunt impedance Z is connected across a transmission line with characteristic impedance Zo. Find the S matrix of the junction.

2. Differentiate : ABCD and S parameters.

3. How does an isolator differ from an attenuator?

4. Mention the application of E plane and H plane tee.

5. A reflex klystron is operated at 9 GHZ with a dc beam voltage of 600V for 1 3/4 mode, repller space length of 1 mm and dc beam current of 10mA. Beam coupling coefficient to be 1. Calculate the repeller voltage.

6. List the application of TWT amplifier.

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

8. Compare IMPATT and GUNN Diode.

9. Calculate the VSWR in dB in a 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 three port circulator has an insertion loss of 1 dB. Isolation 30dB and VSWR = 1.5. Find the Smatrix. (8)

    (ii) State and Prove the Properties of S matrix. (8)

Or

    (b) (i) Show using S matrix theory that a lossless non-reciprocal two port microwave device cannot be constructed. (8)

    (ii) Explain the relationship between Y-Z and ABCD parameters with S parameters. (8)

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 port 5 by impedance of reflection coefficients $\lceil 1 = 0.5, \lceil 2 = 0.6$ and $\lceil 4 = 0.8$ 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) With neat diagram, explain the mechanism and modes of operation of two Cavity klystron amplifier. Derive the equation for power output and efficiency.

Or

    (b) A normal cylindrical magnetron has the following parameters. Inner radius (i) 0.15 meter, outer radius (ii) = 0.45m magnetic flux density Bo = 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.

14. (a) Explain the structure, working of Gunn diode and mention its merits, demerits and applications.

Or

    (b) Explain the following microwave device working principle.

    (i) Tunnel diode (8)

    (ii) Parametric amplifier. (8)

15. (a) With neat microwave bench block diagram, explain antenna radiation pattern measurement and VSWR measurement.

Or

(b) Discuss the significance of following microwave measuring instruments with neat diagram.

(i) Slotted Line Carriage (5)

(ii) VSWR meter (5)

(iii) Cavity Resonator. (6)

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