Question Paper Code : 52926

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh Semester

Electronics and Communication Engineering

EC 6701 — RF AND MICROWAVE ENGINEERING

(Regulation 2013)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the frequency range of C and X-band.

2. The S matrix of a reciprocal microwave junction is a symmetric matrix - justify.

3. Write the necessary and sufficient conditions for an amplifier to be unconditionally stable.

4. What is meant by impedance matching? List the different impedance matching techniques.

5. Give the significance of E-plane and H-plane bends?

6. Find the S matrix of a matched isolator with 1.0 dB insertion loss and 30 dB isolation.

7. Why cant conventional tubes be used at microwave frequencies?

8. What are the different modes of operation realisable with gunn diode?

9. Mention the sensors used for microwave power measurement.

10. Mention a few techniques used for measurement of an impedance at microwave frequency?

PART B — (5 × 13 = 65 marks)

11. (a) Derive the S parameter for a two port microwave network. Discuss the physical significance of the four S parameters used to characterise the microwave circuit performance? Discuss the properties of S parameters.

Or

(b) Find the S parameters of a waveguide component if the measured VSWR = 1.3 when the component is terminated with a matched load. It is also found that the power to the load is 60 mW for an input power of 100 mW. The same results are obtained when the component is reversed.

12. (a) State and formulate the transducer power gain, available power gain and operating power gain of a microwave amplifier in terms of S parameters and different reflection coefficient.

Or

(b) Derive stability conditions for a microwave amplifier.

13. (a) Why isolator is known as uniline device? What are the applications of an isolator? Derive the S matrix for 3 – port circulator and explain the physical significance of each parameters.

Or

(b) (i) A directional coupler has coupling factor of 10 dB and a directivity of 30 dB. If the power in the isolated port is 40 μw. Find the power in the input port and also in the through port. What is the insertion loss of the coupler? (7)

(ii) A 5 dB attenuator is specified as having a VSWR of 1.2. Assuming that it is reciprocal, find its S – matrix. (6)

14. (a) Discuss the operation of reflex klystron microwave oscillator with diagrams.

Or

(b) What is an IMPATT diode? Discuss the operation of an IMPATT diode with neat diagram? Mention the applications of an IMPATT diode?

15. (a) Explain the frequency and wavelength measurement with neat diagram.

Or

(b) Discuss the functions of the following with block diagram :

(i) Spectrum analyzer (6)

(ii) Network analyzer. (7)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Explain the principle of working of isolators. Describe in detail the working of a faraday rotation isolator. Give the S matrix of it. (8)

(ii) Discuss about Irises and give their equivalent circuit. (7)

Or

(b) With neat sketch explain how a travelling wave tube operates? Specify the role of slow wave structures in it. (15)