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Question Paper Code : X65658

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Seventh Semester
Electronics and Communication Engineering
080290059 – MICROWAVE ENGINEERING
(Regulations 2008)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. A two port network has the following S-matrix. Find whether the network is reciprocal.

$$A = \begin{bmatrix} 0.1 & j0.6 \\ j0.6 & 0.2 \end{bmatrix}$$

2. Write the applications of bends and twists.
3. What is velocity modulation ?
4. What is convection current ?
5. Distinguish the ranges of low and high VSWRs for VSWR measurement.
6. What is insertion loss ?
7. An IMPATT diode has the following parameters : carrier drift velocity = 2×10^7 cm/s and drift region length = $6 \mu\text{m}$. Determine the resonant frequency.
8. What are the different modes of operation of a Gunn diode ?
9. State any two characteristics of ideal substrate materials.
10. What are strip lines ?



PART – B

(5×16=80 Marks)

11. a) i) Explain the relevance and suitability of S-parameters for the study of microwave networks and discuss the S-Matrix formulation for a general N-Port microwave network. (8)
- ii) Describe the properties of the S-matrix of lossless networks and also discuss the effect of shift of the reference planes on the S-matrix of an N-port microwave network. (8)
- (OR)
- b) i) Describe the operation of a four port, two hole directional coupler with neat diagrams and also derive its S-matrix. (10)
- ii) The scattering parameters of a certain two port network were measured to be $S_{11} = 0.3 + j0.7$, $S_{12} = S_{21} = j0.6$ and $S_{22} = 0.3 - j0.7$. Find the equivalent ABCD and Y-parameters, if the characteristic impedance is 50Ω . (6)
12. a) What is transit time effect ? How can that effect be reflected with the help of two cavity Klystron amplifier ? (16)
- (OR)
- b) Explain the working principle of magnetron. (16)
13. a) i) Describe the high VSWR measurement procedure and explain the errors in standing wave measurement. (8)
- ii) Draw the block diagram of a network analyzer and explain its working and uses. (8)
- (OR)
- b) i) Describe the process of return loss measurement using directional coupler. (8)
- ii) Explain the measurement of impedance with slotted line. (8)
14. a) i) Compare the principle of transferred electron devices and avalanche transit time devices. (8)
- ii) Draw and explain the operation of TRAPATT diodes and discuss the important differences between IMPATT and TRAPATT diodes. (8)
- (OR)
- b) i) Describe the Manley-Rowe power relations for a parametric amplifier with necessary diagram and equations. (8)
- ii) Explain the principle and operation of parametric up converter and negative resistance parametric amplifier with necessary diagrams and expressions for the noise figure and bandwidth. (8)



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)**
