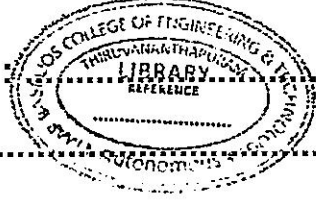


(Pages : 3)

N – 5754

Reg. No.

Name :



Eighth Semester B.Tech. Degree Examination, April 2022

(2013 Scheme)

Elective – V

13.805.6 : MICROWAVE DEVICES AND CIRCUITS (T)

Time : 3 Hours

Max. Marks : 100

PART – A

Answer **all** questions.

1. Write the equation of the characteristic impedance of a wire-over-ground transmission line.
2. State the different band span of microwave frequencies.
3. Define the directivity of directional coupler.
4. What are the Properties of s-matrix?
5. Give the properties of impedance [z] and admittance [y] matrix?
6. What is the Key phenomenon taking place in TRAPATT diode?
7. Define Gunn Effect.
8. What are the assumptions for calculation of RF power in Reflex Klystron?
9. State the impact of slow wave structures used in TWT amplifiers?
10. Why phase focusing effect is important in magnetron?

(10 × 2 = 20 Marks)

P.T.O.



PART – B

Answer **one full** questions from **each** Module, 20 marks **each**.

Module – I

11. (a) Compare micro-strip and strip line from the perspective of sensitivity to the dielectric coefficient. 8
- (b) A lossless parallel strip line has a conducting strip width w . The substrate dielectric separating the two conducting strips has a relative dielectric constant of 6 and a thickness of 4 mm. Calculate the required width of the conducting strip in order to have a characteristic impedance of 5Ω , strip line capacitance and inductance, phase velocity of the wave in the parallel strip line. 12

OR

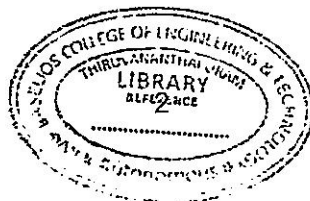
12. (a) Discuss various aspects of coupling effects in transmission line configuration. 10
- (b) Explain how to calculate transmission power and power losses of rectangular wave guide. 10

Module – II

13. (a) What is directional coupler? Derive the S-matrix of two-hole directional coupler. 10
- (b) Derive the expression to find line impedance of transmission line. 10

OR

14. Derive the S-matrix for H-plane Tee and explain the operation of Magic plan tee. 20



N – 5754



Module – III

15. A microwave tunnel diode has a negative resonance resistance R_n and a resonance circuit has a circuit resistance R_c . Derive an equation to calculate gain of a microwave tunnel diode amplifier. **20**

OR

16. Derive the power gain, for frequency relations of Hetero junction Bipolar Transistors and explain the electronics applications of HBT. **20**

Module – IV

17. (a) Describe and derive Manley and Rowe Relations regarding power flow. **10**
(b) Derive the expression to find Transient Time for reflex klystron. **10**

OR

18. (a) A reflex klystron operates under the following conditions $V_0 = 600\text{v}$, $L = 1\text{ mm}$, $R_{sh} = 15\text{ K}\Omega$, $e/m = 1.759 \times 10^{11}$ (MKS system), $f_r = 9\text{ GHz}$, the tube is oscillating at f at the peak of $n = 2$ mode or $1\frac{3}{4}$ mode. Assume that transit time through the gap and beam load can be neglected.
(i) Find the value of repeller voltage.
(ii) Find the direct current necessary to give microwave gap voltage of 200
(iii) What is electronic efficiency under this condition? **12**
(b) Explain the operating principles of helix travelling wave tubes. **8**

(4 × 20 = 80 Marks)

