9. (a) Explain the working principle Gunn diode. 6
   (b) Explain the up and down converter with reference to parametric amplifier. 7
10. Write short notes on (any **Three**)
   (i) Microstrip lines 5
   (ii) Detector diode 4
   (iii) IMPATT Diode 5
   (iv) MASER 4

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Faculty of Engineering & Technology
Eighth Semester B.E. (Electronics and Telecomm. Engg.) Examination
VHF AND MICROWAVE
Sections—A & B

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) Answer **THREE** questions from Section A and **THREE** questions from Section B.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.

SECTION—A

1. (a) What are the limitations of conventional vaccum tubes of microwave frequencies ? Explain how these limitations can be overcome. 6
   (b) A two cavity Klystron amplifier has the following parameters. 8

   Beam Voltage $V_0 = 900V$

   Beam Current $I_0 = 30mA$

   Frequency $f = 8GHz$.

   Gap spacing ie. either cavity $d = 1mm$ spacing between centres of cavity $L = 4cm$. Effective shunt impedance

$R_{sh} = 40\,K\Omega$.

Determine :

(i) The electron velocity

(ii) The dc transit time

(iii) The input voltage for maximum output voltage

(iv) Voltage gain in dB.

2. (a) Derive the equation of output current of Reflex Klystron and prove that the maximum efficiency is 22.7%. 6

(b) A Reflex Klystron operates under the following conditions. 7

Beam voltage $V_o = 600V$

Distance between cavity and repeller $L = 4cm$

Ratio $e/m = 1.759 \times 10^{11}$

Resonant frequency $f_r = 9HGz$

$R_{sh} = 15\,k\Omega$.

The tube is oscillating at f_r at the peak of n=2 mode.. Assume that the transient time through the gap and beam loading can be neglected.

(i) Find the value of repeller voltage

(ii) Find the direct current necessary to give a microwave gap voltage of 200V

(iii) Find the electronic efficiency. $f_r J_1(X^1) = 0.5$

3. (a) Derive the mathematic equation for cutoff magnetic flux density of megatron and show that path of electron is parabolic. 8

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(b) Explain how mode Separation is achieved in magnetron. 5

4. (a) Explain the working principle and operation of helix TWT. 6

(b) Explain the BWO with neat diagram and derive the expression for frequency. 7

5. (a) Discuss the transmission characteristics of E-Plane tee and derive the scattering matrix for the same. 6

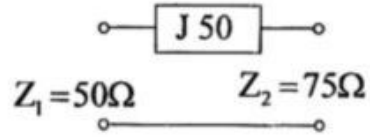
(b) State and prove Zero property and Unitary propery of scattering matrix. 7

SECTION–B

6. (a) Define coupling coefficient and directivity of directional coupler and obtain the scattering matrix for the same. 7

(b) State and prove the Carlins theorem for a lossless three part network. 6

7. (a) For the series element shown, Find the scattering matrix.



6

(b) Explain the principle of Gyrator. Design a four part circulator using magic tees and gyrator and explain it's working. 7

8. (a) Explain measurement of microwave power using bolometer method. 6

(b) Explain microwave filter desisn using image parameter method. 7

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