Paper id: 251025

Roll No: | | | | | | | | | | | | |

BTECH
(SEM VI) THEORY EXAMINATION 2024-25
MICROWAVE ENGINEERING

TIME: 3 HRS　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. **Attempt *all* questions in brief.**　　　　　　　　　　　　**02 x 7 = 14**

Q no.	Question	CO	Level
a.	Define TEM wave?	1	K1
b.	Differentiate TE wave and TM wave?	1	K1
c.	What is the principle of phase shifter?	3	K1
d.	Mention the dominant modes of a rectangular and circular waveguide?	2	K2
e.	Why low frequency parameters are not used in microwaves?	5	K1
f.	Write the unitary properties of S matrix?	4	K1
g.	What is the significance of VSWR measurements?	5	K1

SECTION B

2. **Attempt any *three* of the following:**　　　　　　　　　**07 x 3 = 21**

a.	Explain the operation of reflex klystron with neat diagram?	3	K2
b.	Write short notes on power sensors used for microwave power measurement?	5	K2
c.	Identify the important points about Backward wave Crossed field amplifier.	3	K1
d.	Explain following terms (a)E-plane Tee (b) H-plane Tee (c) Magic Tee	2	K2
e.	Explain clearly how a GUNN diode is different from a tunnel Diode Both A & B being negative resistance devices.	4	K3

SECTION C

3. **Attempt any *one* part of the following:**　　　　　　　**07 x 1 = 07**

a.	Derive the characteristic equations of Transverse Electric wave. A parallel plane wave guide with plate separation of 0.03 m with TE10 mode is excited at 6 GHz. Find the cutoff frequency, cutoff wavelength, guide wavelength and group velocity?	1	K4
b.	Discuss how a decrease in drift velocity with increasing electric field can lead to the formation of a high field domain for microwave generation and amplification?	3	K4

4. **Attempt any *one* part of the following:**　　　　　　　**07 x 1 = 07**

a.	A 20db directional coupler gives 3dbm in output power through coupled port. If the Isolation specified as 55 dB, find the power available at the Isolated Port?	2	K3
b.	Derive the S –matrix for n-port network. Prove that the S-Matrix for a reciprocal network is symmetric	2	K4

5. **Attempt any *one* part of the following:**　　　　　　　**07 x 1 = 07**

a.	Analyze the theory of oscillations in a magnetron. Examine the expressions for Hull Cut off magnetic and voltage equations.	4	K2
b.	What is the bunching process of a two-cavity klystron? Define optimum bunching distance L_{opt}. and derive the expression for it?	3	K3

6. **Attempt any *one* part of the following:**　　　　　　　**07 x 1 = 07**

a.	A travelling wave tube operates under the following parameters: Beam voltage Vo= 3kV; Bean current Io = 30mA; Characteristics impedance of helix Zo = 10 ohm; Circuit length = N=50 m; Frequency f = 10 GHz. Determine (i) Gain parameters, (ii) Output power Ap in dB.	3	K4

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b.	Discuss the VSWR, impedance, wavelength and frequency measurement using slotted line method.	5	K3
7.	**Attempt any *one* part of the following:** 07 x 1 = 07		
a.	Give the classification of solid state microwave devices along with examples? Explain Two Valley Model Theory?	4	K2
b.	Mention how a TWT can be converted to an oscillator. Explain the operation of such a device. Why large tuning range, are possible with such a device?	3	K3