CS/B.TECH(ECE-NEW) (SUPPLE)/SEM-7/EC-701(N)/09 RF AND MICROWAVE ENGINEERING (SEMESTER - 7)

1. Signature of Invigilator								O lied _	7		4	
2 Reg. Signature of the Officer-in-Charge	No.											
Roll No. of the Candidate												
CS/B.TECH(ECE-NE ENGINEERING & MAN RF AND MICROWAVI	AGE	MENT	EXA	MIN	ATI	ONS	, JU	LY -	200 ST	09		
INSTRUCTIONS TO THE CANDIDAT	TES :											

- This Booklet is a Question-cum-Answer Booklet. The Booklet consists of 32 pages. The questions of this 1. concerned subject commence from Page No. 3.
- 2. In Group - A, Questions are of Multiple Choice type. You have to write the correct choice in the box provided against each question.
 - b) For Groups - B & C you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of $\mathbf{Group} - \mathbf{B}$ are Short answer type. Questions of $\mathbf{Group} - \mathbf{C}$ are Long answer type. Write on both sides of the paper.
- 3. Fill in your Roll No. in the box provided as in your Admit Card before answering the questions.
- 4. Read the instructions given inside carefully before answering.
- You should not forget to write the corresponding question numbers while answering. 5.
- Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
- Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall. 7.
- You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, which will lead to disqualification.
- Rough work, if necessary is to be done in this booklet only and cross it through.

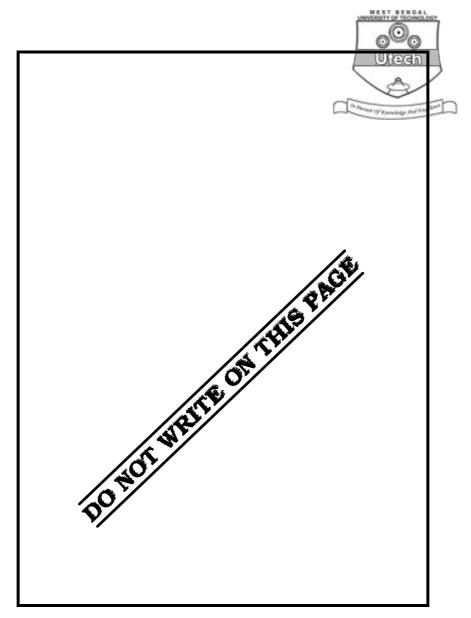
No additional sheets are to be used and no loose paper will be provided

FOR OFFICE USE / EVALUATION ONLY																		
Marks Obtained																		
Group – A						Group – B			Gro	oup -	- C							
Question																	Total	Examiner's
Number																	Marks	Signature
Marks																		
Obtained																		

Head-Examiner/Co-Ordinator/Scrutineer

S-53009 (27/07) (N)







CS/B.TECH(ECE-NEW) (SUPPLE)/SEM-7/EC-701(N)/09 RF AND MICROWAVE ENGINEERING SEMESTER - 7

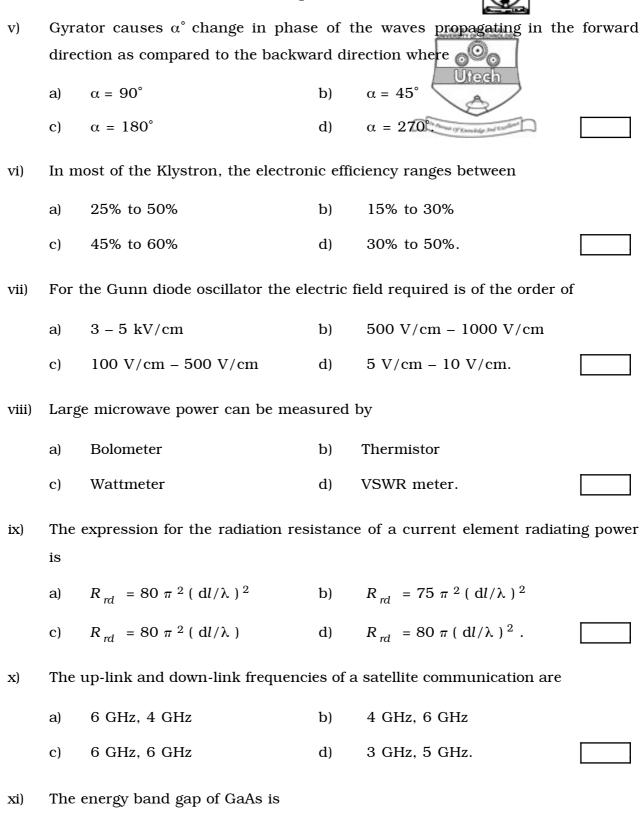
Time: 3 Hours]

Full Marks : 70

GROUP - A

			_			
			(Multiple Ch	oice Type	Questions)	
1.	Cho	10 × 1 = 10				
	i)	Gro	up velocity is denoted by V	V_g where		
		a)	$V_g = d\omega/d\beta$	b)	$V_g = d\beta/d\omega$	
		c)	$V_g = 1/\sqrt{\mu} \in$	d)	V_g = $\omega/(2\pi/\lambda g$).	
	ii)	Cut	-off wavelength λ_{C}^{-} of a red	ctangular w	aveguide is	
		a)	2π / (ω_{C} $\sqrt{\mu} \in$)		2π / ($\omega_{C}^{}$ ($\mu/\in)$)	
		c)	$2\pi/\omega_{C}$	d)	$\lambda / \sqrt{1 - (f_c/f)^2}$.	
	iii)	The	power flowing through th	ne waveguio	de in the TE_{10} mode in	n a rectangular
		wav	reguide is given by			
		a)	$P_{T} = \frac{ab\omega^{2}\mu^{2}\beta^{2}}{4Z_{TE}(\pi/a)^{2}}$	b)	$P_{T} = \frac{a^{2} \omega^{2} \mu^{2} \beta^{2}}{4Z_{TE} (\pi/b)^{2}}$	
		c)	$P_{T} = \frac{b^{2} \omega^{2} \mu^{2} \beta^{2}}{4Z_{TE} (\pi/\alpha)^{2}}$	d)	$P_{T} = \frac{ab\omega^{2}\mu^{2}\beta^{2}}{16Z_{TE} (\pi/a)^{2}}.$	
	iv)	In c	ase of bends the radius of	curvature i	for the minimum reflection	n is given by
		a)	R = 1.5 b for E -bend			
			R = 1.5 a for H-bend			
		b)	R = 2.5 b for E -bend			
			R = 1.5 a for H -bend			
		c)	R = 1.5 a for E -bend			
			R = 2.0 b for H -bend			
		d)	R = 2.0 a for E-bend			

R = 2.0 b for H-bend.



2.5 ev

1.0 ev.

b)

d)

a)

c)

1.43 ev

0.7 ev



- xii) The substrate material used for MMIC should have
 - a) Low thermal conductivity
 - b) Very low thermal conductivity
 - c) High thermal conductivity
 - d) Moderately high thermal conductivity.



xiii) For a homogeneous dielectric medium, the propagation delay time per unit length

is

a)
$$T_d = \sqrt{\mu/\epsilon}$$

b)
$$T_d = \sqrt{\mu} \in$$

c)
$$T_d = \sqrt{\in/\mu}$$

d)
$$T_d = \mu \in$$
.

- xiv) A hollow waveguide behaves as
 - a) low pass filter

b) band pass filter

c) high pass filter

- d) all pass filter.
- xv) The dominant mode of propagation is a circular waveguide is
 - a) TE₁₁

b) TE₁₀

c) TM₁₁

d) TM_{10} .

GROUP - B

(Short Answer Type Questions)

Answer any three of the following.

 $3 \times 5 = 15$

- 2. A rectangular waveguide has a=3.0 cm, b=1.5 cm, $\mu=1$ and $\epsilon=2.25$. Find the cut-off wavelength for TE_{10} mode.
- 3. What is Busch's theorem?
- 4. What are the roles of the Ferrites in microwave devices?
- 5. What is stripline filters?
- 6. Write the causes of noise in microwave tubes.

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GROUP - C

(Long Answer Type Questions)

Answer any three questions.

 $3 \times 15 = 45$

- 7. a) Why is GaAs superior to silicon as the microwave semiconductor material?
 - b) Explain the principle of operation of Gunn diode.
 - c) Why is the tunnel diode important in microwave work?

2 + 8 + 5

- 8. a) What are the advantages of using MIC?
 - b) What are the limitations of MIC?

10 + 5

- 9. a) Find the expression for the Hull cut-off magnetic field and Hull cut-off voltage.
 - b) A 250 kW pulsed cylindrical magnetron is operated with the following parameters :

Anode voltage = 25 kV

Peak anode current = 25 A

Magnetic field = 0.35 Wb/m^2

Radius of cathode cylinder = 4 cm

Radius of cylinder = 8 cm.

Calculate

- i) The cyclotron frequency
- ii) Hull cut-off magnetic field.

5 + 5 + 5

- 10. a) Draw current distribution and the field pattern in a cylindrical resonator at ${\rm TM}_{010}$ resonator mode.
 - b) A Co-axial resonator is constructed of a section of Co-axial line 6 cm long and is shorted at both ends. The circular cavity has an inner radius of 1.5 cm and an outer radius of 3.5 cm. The line is filled with dielectric \in = 2·25. Calculate the Q of the cavity.
- 11. a) Describe the method of measurement of Q using slotted line method.
 - b) A slotted line is used in association with an *X*-band microwave source. When the line is terminated by a short circuit, adjacent nulls are found at position which are shown as 9.27 and 11.05 cm. What is the value of the guide wavelength?

7 + 8

END