Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3171001 Date:08-12-2023

Subject Name: Microwave Theory and Techniques

Time: 10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	List out the similarities and dissimilarities of microwave transmission lines and waveguides.	**03**
	(b)	Draw rectangular and circular waveguides and discuss their benefits as well as drawbacks.	**04**
	(c)	Define microwaves. In which frequency bands microwave communication work? Discuss various applications of microwave communication in different domains.	**07**
Q.2	**(a)**	Explain in brief what TE, TM and TEM modes are in a rectangular waveguide.	**03**
	(b)	Discuss and Compare the differences between Strip lines and Microstrip lines and enlist the benefits of Microstip lines in brief.	**04**
	(c)	What is a dominant mode in a rectangular waveguide? Derive field equations of TE mode for rectangular waveguide.	**07**
		OR	
	(c)	What is reflection coefficient in a transmission line? Why do we need scattering parameter in a waveguide? Discuss scattering matrix and list various properties of S-parameter.	**07**
Q.3	**(a)**	What are faraday rotation devices? How such a device can work as a duplexer?	**03**
	(b)	What is a Hybrid Tee? Enlist its applications. Describe how it can be able to measure impedance on any unknown microwave device.	**04**
	(c)	What is the basic difference between two cavity klystron amplifier and klystron oscillator in construction? Discuss klystron oscillator with apple gate diagram and its applications in brief.	**07**
		OR	
Q.3	**(a)**	Discuss fixed and variable attenuators with their applications in brief.	**03**
	(b)	Discuss Isolation and Coupling, Isolation and Directivity factors in connection with Directional Coupler.	**04**
	(c)	What are favorable electrons? Draw cavity magnetron and explain its working with clear diagrams for π-mode and phase focusing effect.	**07**
Q.4	**(a)**	What is avalanche transit time effect? Explain basic construction and operation of TRAPATT device.	**03**
	(b)	Describe in brief the operation of microwave power amplifier with their applications.	**04**
	(c)	Discuss the effect of microwave radiation on a human body. What are the sources of EMI? Discuss Intra and Inter system EMI with some relevant examples.	**07**
		OR	

Q.4	**(a)**	Discuss construction and V-I characteristics of a Gunn Diode.	**03**
	(b)	What is a Low Noise Amplifier (LNA)? How is it designed? What is its role in microwave communication?	**04**
	(c)	How to prevent EMI? What is the role of Electromagnetic Compatibility? Discuss various standards of it.	**07**
Q.5	**(a)**	Discuss microwave imaging with some practical applications.	**03**
	(b)	How can we design a microwave oscillator? Where is it applicable for practical usage?	**04**
	(c)	Draw a basic block diagram of spectrum analyzer. Discuss in brief about its operation with explanation on how a spectral measurement is conducted through it.	**07**

OR

Q.5	**(a)**	What are MMICs? Provide some examples of such ICs.	**03**
	(b)	Which antennas are popular for various microwave applications? List them. Briefly discuss planner antenna.	**04**
	(c)	How can we measure microwave frequencies using frequency meter and slotted line section? Explain both the methods with relevant block diagrams and valid explanations.	**07**

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