Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3171001 Date:30-11-2024

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)**	Define the degenerate modes, dominant mode, TEM mode, TM mode, and TE mode.	**03**
	(b)	List out the advantages of microwaves and explain each briefly.	**04**
	(c)	List out the various applications of microwaves and explain each briefly.	**07**
Q.2	**(a)**	Justify, why TEM mode does not propagate through waveguide?	**03**
	(b)	Compare the transmission line and the waveguide.	**04**
	(c)	Compare the rectangular and circular waveguide.	**07**
		OR	
	(c)	Prove with proper derivation that for E-plane tee S_{11}, S_{22}, and S_{33} cannot be zero simultaneously.	**07**
Q.3	**(a)**	Justify, why H, Y, Z and ABCD parameters cannot be used for microwave network analysis?	**03**
	(b)	List out the properties of S-matrix and explain each briefly.	**04**
	(c)	Design an unknown impedance measurement system, mixer, and duplexer using magic tee.	**07**
		OR	
Q.3	**(a)**	Explain the construction of Gunn diode with proper figure.	**03**
	(b)	Write a short note on electromagnetic interference and electromagnetic compatibility.	**04**
	(c)	Derive the simplified S-matrix for the two hole directional coupler. Also define coupling factor, directivity, and isolation factor in the context of two hole directional coupler.	**07**
Q.4	**(a)**	List out the high frequency limitations of conventional tubes.	**03**
	(b)	Write a short-note on schottky barrier diode. Also list out its applications.	**04**
	(c)	Explain the IMPATT diode in detail with necessary figures. Also list out its applications.	**07**
		OR	
Q.4	**(a)**	List out the applications of PIN diode. Explain each briefly.	**03**
	(b)	Compare the klystron amplifier and TWT amplifier.	**04**
	(c)	Explain the multi-cavity magnetron with proper figures. Also list out the specifications and applications of multi-cavity magnetron.	**07**
Q.5	**(a)**	Write short- note on “effect of microwaves on human body”	**03**
	(b)	Write a short-note on microwave antennas.	**04**
	(c)	List out the methods for measuring microwave frequency. Explain the microwave frequency measurement using slotted line in detail.	**07**

OR

Q.5	**(a)**	List out the applications of microwave imaging and explain each in brief.	**03**
	(b)	Explain the role of network analyzer and spectrum analyzer in microwave measurement.	**04**
	(c)	Explain satellite and GPS microwave systems in details.	**07**

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