

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2022****Subject Code:3171001****Date:10-01-2023****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 Microstrip 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 planar 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**
