

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2022****Subject Code:2171001****Date:01/06/2022****Subject Name: Microwave Engineering****Time:02:30 PM TO 05:00 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) Explain TEM, TE and TM Mode. | 03 | |
| | (b) Explain advantages of microwave and its application. Also draw a diagram of microwave communication system. | 04 | |
| | (c) Define the following: | 07 | |
| | (i) Group velocity | | |
| | (ii) Phase velocity | | |
| | (iii) Degenerate mode | | |
| | (iv) Return loss | | |
| Q.2 | (a) Explain the quarter wave transform for impedance matching application. | 03 | |
| | (b) Derive transmission line equations and solution of transmission line equation. | 04 | |
| | (c) Derive impedance transformation relationship, if known impedance at load point on transmission line is Z_1 and unknown impedance at any other point on transmission line towards generator is Z_2 at distance d from Z_1 . | 07 | |
| | OR | | |
| | (c) What is standing wave? Derive the equation of voltage standing wave ratio in terms of reflection coefficient. | 07 | |
| | Q.3 | (a) Derive the S matrix for isolator. | 03 |
| | | (b) What is VSWR for a) open circuit load b) short circuit load (Assume $Z_0=50\Omega$). | 04 |
| (c) Explain the operation of magic TEE with its s-parameter. | | 07 | |
| OR | | | |
| Q.3 | (a) List various microwave junction devices. Write the scattering matrix for H arm TEE. | 03 | |
| | (b) Discuss the properties of S-parameter. | 04 | |
| | (c) Explain in brief reflection coefficient. Also derive the expression for the reflection coefficient at load point. | 07 | |
| Q.4 | (a) List microwave antennas. | 03 | |
| | (b) Explain role of spectrum analyzer in microwave measurements. | 04 | |
| | (c) What is Gunn effect? Explain working of Gunn diode. | 07 | |
| OR | | | |
| Q.4 | (a) Give difference between two cavity klystron and reflex klystron. | 03 | |
| | (b) Explain electromagnetic interference and microwave imaging. | 04 | |

- (c) Explain working of reflex klystron. **07**
- Q.5** (a) Discuss RF MEMS for microwave components. **03**
(b) List applications and advantages of microwave solid state devices. **04**
(c) Explain Microwave Communication in Satellite System. **07**

OR

- Q.5** (a) What are the problems associated to conventional tubes at microwave frequencies? **03**
(b) Write notes on medical and civil related application of microwave. **04**
(c) Describe Microwave RADAR system. **07**
