

**R15**

Code No: 127FE

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech IV Year I Semester Examinations, July/August - 2023**

**MICROWAVE ENGINEERING**  
**(Electronics and Communication Engineering)**

**Time: 3 Hours**

**Max. Marks: 75**

- Note:** i) Question paper consists of Part A, Part B.  
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.  
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A**

**(25 Marks)**

- 1.a) Define an effective dielectric constant in microstrip lines. [2]
- b) List the microwave frequency bands. [3]
- c) What is Faraday rotation? [2]
- d) Name the three types of coupling devices. [3]
- e) What is the advantage of Reflex Klystron over 2-cavity Klystron? [2]
- f) What are slow wave structures? Why are they used? [3]
- g) What are the different types of Magnetrons? [2]
- h) Give the classification of microwave solid state devices. [3]
- i) What is a bolometer? [2]
- j) Define Scattering matrix. Give its significance. [3]

**PART – B**

**(50 Marks)**

- 2.a) Analyze TM mode in rectangular waveguide.
- b) Explain about phase and group velocities. [6+4]

**OR**

- 3.a) Explain in detail about power losses in rectangular waveguides.
- b) Give expressions for power transmitted through rectangular waveguide for TE and TM modes. [6+4]

4. Write notes on the following.
  - a) E-plane Tee
  - b) Microwave Circulator [5+5]

**OR**

- 5.a) What is a directional coupler? Explain and illustrate a two-hole directional coupler.
- b) Write briefly on waveguide phase shifters. [5+5]

6. With a neat diagram of the structure of 2-cavity Klystron, explain the bunching process in it. [10]

**OR**

- 7.a) Explain the limitations of conventional tubes at microwave frequencies.
- b) Derive an expression for output power gain of helix TWT in decibels. [6+4]

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8. Explain the working of Cylindrical Travelling Wave Magnetron with neat sketches. [10]

9.a) Draw the V-I characteristics of Gunn diode and explain how it generates oscillations. [6+4]

b) Describe the LSA mode of a Gunn diode.

10. Calculate S-matrices for the following.

a) H-plane Tee

b) Magic Tee

[5+5]

11. Explain in detail about measurement of low and high VSWR.

[10]

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