

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (R), DECEMBER 2023**ELECTRONICS AND COMMUNICATION ENGINEERING****(2020 SCHEME)****Course Code : 20ECT401****Course Name: Microwaves and Antennas****Max. Marks : 100****Duration: 3 Hours****PART A****(Answer all questions. Each question carries 3 marks)**

1. Define directivity of an antenna.
2. Define radiation efficiency of an antenna.
3. Explain the antenna suitable for mobile communication.
4. Explain the principle of Log periodic antenna array.
5. State the principle of pattern multiplication.
6. Explain the concept of phased array.
7. Define S-matrix of a two-port microwave network.
8. Illustrate and explain hybrid rings.
9. Explain velocity modulation.
10. Draw the applegate diagram for two cavity klystron.

PART B**(Answer one full question from each module, each question carries 14 marks)****MODULE I**

11. a) State and prove reciprocity theorem as applied to antennas. (10)
- b) Distinguish between effective aperture and physical aperture of an antenna. (4)

OR

12. a) Derive the expressions for far field components and radiation resistance of a half wave dipole. (10)
- b) Explain different antenna field zones. (4)

MODULE II

13. a) With neat diagram explain horn antenna. (7)
- b) Explain axial mode and normal mode of helical antenna. (7)

OR

14. Explain rectangular microstrip patch antenna with its design steps. (14)

MODULE III

15. a) Derive the expression for array factor of an n-element linear uniform array and obtain its maximum value. (5)
b) Design a broad side antenna array of n elements and sketch its radiation pattern. (9)

OR

16. a) Explain Dolph-Chebyshev array and write down the expression for array factor. (10)
b) Explain grating lobes. (4)

MODULE IV

17. a) With a schematic, describe the operation of a four-port circulator. Obtain the simplified S-matrix of a perfectly matched lossless 4-port circulator. (7)
b) Justify that a ferrite isolator can support only forward direction waves with necessary diagrams. (7)

OR

18. a) Illustrate and explain the different modes of operation of Gunn diode. (8)
b) Explain the working of microwave amplifier using MESFET (6)

MODULE V

19. a) Illustrate and explain reflex klystron. (8)
b) Explain helix TWT. (6)

OR

20. a) Explain the bunching process of magnetron. (8)
b) Explain the amplification process in slow wave structures. (6)
