Roll No…….. **Total No. of Printed Pages: 01**
Total No. of Questions: [09]

B. Tech (ECE) (Semester –6th)
MICROWAVE THEORY AND TECHNIQUES
Subject Code: BECED1-611
Paper ID: [18111329]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) Which frequency band is typically used for satellite communication?

b) Discuss one advantage of using waveguides over transmission lines in high-frequency applications.

c) Define characteristic impedance in the context of transmission lines and waveguides

d) What is the primary function of a directional coupler in microwave systems?

e) Describe the key features and components of a smart antenna system.

f) Explain how wavelength and frequency are related in electromagnetic waves.

g) Briefly describe what the radiation pattern of an antenna represents.

h) How does a high SWR affect the efficiency and performance of a communication system?

i) What is the main function of a reflex klystron oscillator?

j) Explain the principle of operation of a magnetron.

Section – B **(5 marks each)**

Q2. Define what a rectangular waveguide is and briefly explain its structure.

Q3. Explain the concept of resonance in cavity resonators and how it is utilized in microwave engineering.

Q4. Define TE, TM, and TEM modes in the context of waveguides.

Q5. Compare and contrast terrestrial and satellite communication systems in terms of coverage, reliability, bandwidth, and cost.

Q6. Differentiate between E-plane and H-plane tees in terms of their physical structure. Mention one application where each type of tee is commonly used.

Section – C **(10 marks each)**

Q7. Explain the design and operating principles of microstrip or patch antennas. Discuss the advantages of microstrip antennas.

Q8. Explain the basic principles of radar operation and also mention its application areas.

Q9. Conduct a comparative analysis of aperture antennas, slot antennas, microstrip or patch antennas, and smart antennas.