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# B.M.S. College of Engineering, Bengaluru-560019

**Autonomous Institute Affiliated to VTU**

## February / March 2023 Semester End Main Examinations

**Programme: B.E.** **Semester: V**
**Branch: Electronics and Communication Engineering** **Duration: 3 hrs.**
**Course Code: 16EC5DCMWE** **Max Marks: 100**
**Course: Microwave Engineering** **Date: 01.03.2023**

**Instructions**: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.



### UNIT - I

1 a) Describe the construction, working principles and features along with losses of microstrip line and losses in microstrip lines. **10**

b) A telephone line has R= 6Ω/KM, L=2.2mH/KM, C=0.005μF/KM, G=0.05 μMho. Determine $Z_0$, α, β @ 1 KHz if the line length is 100 Km, determine the attenuation and phase shift of the signal. Calculate the phase velocity of the signal. **05**

c) Mention any five applications of Microwave Engineering. **05**

### UNIT - II

2 a) Define S-Matrix for a two port network. Also discuss the various losses in terms of S-Parameters when ports are terminated with matched load. **05**

b) Two transmission lines of characteristic impedance Z1 and Z2 are joined @ plane PP'. Analyze and express S parameters in terms of impedances. **07**

c) Discuss the properties of S-Matrix. **08**

### UNIT - III

3 a) What is a circulator? A three port circulator has an insertion loss of 1db, isolation 30 dB and VSWR =1.5.Find the S-Matrix. Justify that it is impossible to construct a perfectly matched lossless reciprocal three port junction. **10**

b) Write the S-Matrix of an ideal precision rotary attenuator. Discuss the coaxial line to waveguide adapters in detail. **10**

**OR**

4 a) What is a phase shifter? Discuss precision phase shifter in detail along with mathematical equations. **10**

b) In a H-Plane T-Junction, compute power delivered to the loads 40Ω and 60Ω connected to arms 1 and 2 when 10 mW power is delivered to matched port 3. List any 2 characteristics of magic-T when all the ports are terminated with matched load. **10**

**UNIT - IV**

5 a) Describe a PIN diode along with its operation and explain its application as a Switch. **10**

b) Explain the modes of operation of GUNN diode in detail. **10**

**OR**

6 a) Explain the Schottky diode, with its constructions and operation. Also list few applications of the same. **10**

b) Describe the IMPATT Diodes in details. Also explain the IMPATT diode doping profile and operation. **10**

**UNIT - V**

7 a) What is microwave imaging? Discuss the different techniques of imaging and the principle of operation in detail. **10**

b) Mention the medical and civil applications of microwaves in detail. **10**

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