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**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING**

**SUMMER TERM END TERM EXAMINATION AUGUST 2024**

**Summer Term:** 2024

**Course Code**: ECE3009

**Course Name**: Transmission Line and Waveguides

**Program & Sem**: 4th

**Date**: 05-08-2024

**Time**: 1:00 PM – 4:00 PM

**Max Marks**: 100

**Weightage**: 50 %

**Instructions:**

1. *Read the all questions carefully and answer accordingly.*
2. *Do not write any matter on the question paper other than roll number.*
3. *Any tables/Chart/Graph or data books required, pl. mention here. – Smith Chart*

**Part A [Memory Recall Questions]**

**Answer any 5 Questions. Each question carries 2 marks. (5Qx 4M= 20M)**

1. List the secondary constants of the Transmission Line. (C.O.No.1) [Knowledge]

2. Write the SI unit of R and C. (C.O.No.1) [Knowledge]

3. What is attenuation constant and phase constant. (C.O.No.1) [Knowledge]

4. State the condition for distortion less transmission line. (C.O.No.1) [Knowledge]

5. If propagation constant is purely real the line is said to be \_\_\_\_\_ (C.O.No.1) [Knowledge]

6. Draw the equivalent circuit of a transmission line. (C.O.No.1) [Knowledge]

7. List various types of Transmission lines losses. (C.O.No.1) [Knowledge]

**Part B [Thought Provoking Questions]**

**Answer 2 Questions. Each question carries 10 marks. (2Qx20M=40M)**

**8.** If the dimensions of a rectangular waveguide are 3.5 cm X 2.0 cm, and the frequency of operation is 10 GHz, determine all the possible TE and TM modes that can be propagated in this waveguide. (C.O.No.1) [Comprehension]

**9.** A transmission line of characteristic impedance of Z0 = 50 Ω is terminated by a load RL = ZL = 100 Ω. Find VSWR, Zmin and Zmax. (C.O.No.1) [Comprehension]

**10**. A rectangular waveguide with dimensions a = 2 cm and b = 1 cm filled with (µr = 1, ϵr= 81) operates at 3 GHz. Determine all the propagating modes and the corresponding cut-off frequencies.

**Part C [Problem Solving Questions]**

**Answer 2 Questions. Each question carries 10 marks. (2Qx20M=40M)**

**11.** A transmission line of length 0.4λ has a characteristic impedance of 100 Ω and

is terminated in a load impedance of (200 + j180) Ω. Find using smith chart:

1. reflection coefficient,

2. standing wave ratio, and

3. input impedance of the line. (C.O.No.2) [Application]

**12.** In a lossless transmission line, the velocity of propagation is 2.5 X 108 m/s.

Capacitance of the line is 30 pF/m, find:

(a) inductance per meter of the line.

(b) phase constant at 100 MHz

(c) characteristic impedance of the line.(C.O.No.2) [Application]

**13.** A transmission line has a characteristic impedance of 50 Ω and

is terminated in a load impedance of (100 - j80) Ω. Find using smith chart:

1. reflection coefficient,

2. standing wave ratio, and

3. input impedance of the line at a distance of λ/8. (C.O.No.2) [Application]