

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09]

[Total No. of Pages: 02]

Uni. Roll No. ....

Program: B.Tech

Semester: 4

Name of Subject: Electromagnetic Field Theory

Subject Code: PCEC-108

Paper ID: 16224

24-01-2022(M)

**Time Allowed: 02 Hours**

**Max. Marks: 60**

**NOTE:**

- 1) Each question is of 10 marks.
- 2) Attempt any six questions out of nine
- 3) Any missing data may be assumed appropriately

- Q1.** Apply the concepts of electrostatics and magnetostatics to construct the Maxwell's equations in phasor form.
- Q2.** Calculate the characteristic impedance, the attenuation constant, and phase constant of a transmission line if the following measurements have been made on the line
- $$Z_{OC} = 550 \angle -60^\circ \Omega \quad \text{and} \quad Z_{SC} = 550 \angle -14^\circ \Omega$$
- Q3.** Sketch the equivalent circuit of a transmission line and hence derive the transmission line equations for an elemental section of a transmission line.
- Q4.** Discuss the propagation of TE and TM mode in a rectangular waveguide. Can TEM wave propagate in a rectangular waveguide? If not, why?
- Q5.** If the magnetic field  $\vec{H} = (3x\cos\beta + 6y\sin\alpha)\vec{a}_z$ , find current density  $\vec{J}$  if fields are invariant with time.
- Q6.** If the electric field strength,  $E$  of an electromagnetic wave in free space is given by

$$E = 2\cos\omega\left(t - \frac{z}{v_0}\right)a_y \text{ V/m}$$

Evaluate the magnetic field, H.

- Q7.** Derive an expression for the attenuation factor for the TE<sub>1</sub> wave between parallel conducting planes.

- Q8.** Compute the values of field components for waves between parallel plates.
- Q9.** Given  $\vec{E} = E_0 z^2 e^{-t} \vec{a}_x$  in free space, determine if there exists a magnetic field such that both Faraday's law and Ampere's circuital law are satisfied simultaneously.

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