1129
**B.E. (Electronics and Communication Engineering)**
**Third Semester**
**EC-301: Electromagnetic Theory**

Time allowed: 3 Hours                                                    Max. Marks: 50

NOTE: *Attempt* <u>*five*</u> *questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I.   Answer the following:-

   a) What is inconsistency in Ampere's law and how overcome?

   b) Define dominant mode in a waveguide. Write dominant modes in circular and rectangular waveguide.

   c) Define skin depth and surface resistance.

   d) Why TEM mode does not exists in a waveguide? Justify your answer.

   e) What is uniform plane wave? Write important properties of uniform plane wave.

                                                                              (5x2)

## UNIT – I

II.   a) Use the Poisson's equation to find $V$ in the region between two concentric right circular cylinders containing a uniform charge density $\rho$.

   b) Discuss the reflection by a perfect conductor for oblique and normal incidence of wave.                                                              (5,5)

III.   a) Derive the Maxwell's equations in differential and integral forms; also write the physical significance of Maxwell's equations.

   b) State, prove and explain the Poynting Theorem.                          (5,5)

IV.   a) Discuss the boundary conditions at the surface of discontinuity.

   b) For a uniform plane wave in fresh lake water $\sigma = 10^{-3}$ mhos/m, $\varepsilon_r = 80$, $\mu = \mu_o$ Calculate attenuation constant and wavelength for two frequencies 200 MHz and 20 kHz. (5,5)

V.   a) Calculate the ratio of circular waveguide cross sectional area to the rectangular waveguide cross section (TE and TM mode). Assume that both these waveguides have similar or equal cut-off frequencies or wavelengths. Assume suitable data.

   b) Write the basic equation for transmission line; find out input impedance of transmission line terminated with any load impedance ($Z_R$).                (5,5)

P.T.O.

VI. a) Compare a finite and infinite transmission line. Discuss the conditions when a finite transmission line behaves as an infinite transmission line.

b) Derive the attenuation and quality factor of a rectangular waveguide. (5,5)

VII. a) A 20 km line is terminated in its characteristics impedance. At a certain frequency the voltage at 1 km from the sending end is 20% below that at the sending end. Find the voltage across the load impedance in terms of percentage of the sending end voltage.

b) Derive the field components when wave is propagating with TM mode in parallel conducting planes. (5,5)

x-x-x