

(REVISED COURSE)

(3 Hours)

[Total Marks : 100

N.B. : (1) Question No. 1 is **Compulsory**.

(2) Attempt any **four** questions from **remaining**.

(3) **Vector notation** should be used wherever **necessary**.

(4) **Assumptions** made should be **clearly** stated.

1. (a) State Poynting theorem and derive expression for instantaneous Poynting vector. 5
(b) Give Maxwell's equations for time varying fields in differential and integral forms for good conductors and good dielectrics. 5
(c) For free space prove that the value of intrinsic impedance is equal to 377Ω . 5
(d) Derive wave equation for homogeneous unbounded source free medium starting from Maxwell's equations. 5
2. (a) Derive the equation for characteristic impedance of the two wire line. Find the characteristic impedance if $R = 2 \Omega/m$, $L = 8 \text{ nH/m}$, $G = 0.5 \text{ milli mho/m}$, $C = 0.23 \text{ pF/m}$. 10
(b) Using Smith Chart find the input impedance and reflection coefficient at a point 0.64λ from load $z_L = (75 - j 25)\Omega$. Given Characteristic impedance = 50Ω . 10
3. (a) Derive the expressions for the reflection and transmission coefficients in case of reflection from perfect dielectric at (i) Normal incidence (ii) Oblique incidence. 12
(b) Derive boundary conditions for electric and magnetic fields at boundary of two dielectric media. 8
4. Explain the radiation for a short dipole in free space. Show that the power radiated by dipole is— 20
$$P = 80 \pi^2 I_{\text{rms}}^2 (dl/\lambda)^2$$

Hence obtain the expression for the radiation resistance.
5. For an electromagnetic wave travelling between a pair of parallel perfectly conducting planes of infinite extent in y and z directions :— 20
 - (i) Analyse the TE_{run} modes after arriving at field components of TE mode.
 - (ii) Analyse the TM_{run} modes after arriving at field components of TM mode.

6. (a) Obtain the expression for field components of a TE wave propagating through rectangular waveguide. 10
- (b) What is skin effect ? Define skin depth how is it related to the attenuation constant. 6
- (c) What is uniform plane wave ? Explain what is meant by Transverse electromagnetic wave. 4
7. Write Short notes on :— 20
- (a) Concept of retarded potentials
 - (b) Surface impedance of conductor
 - (c) Significance of displacement current
 - (d) Impedance matching using Smith Chart.