

III B. Tech I Semester Supplementary Examinations, July -2023
ELECTROMAGNETIC WAVES AND TRANSMISSION LINES
 (Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
 All Questions Carry Equal Marks

UNIT-I

1. a) Derive the transmission line equations. [9M]
 b) Write in detail about primary and secondary constants of a transmission line. [5M]
 (OR)
2. a) Discuss the characteristics of a distortion less transmission line and also obtain the expressions for propagation constant and characteristic impedance of a distortion less transmission line. [6M]
 b) A distortion less line has $Z_0 = 60\Omega$, $\alpha = 20 \text{ mNp/m}$, $u = 0.6c$, where c is speed of light in vacuum. Find R , L , G and C at 110 MHz. [8M]

UNIT-II

3. a) An antenna of impedance $40 + j30\Omega$ is to be matched to a 100Ω lossless line with a shorted stub. Determine the distance between the stub and antenna using smith chart. [7M]
 b) Derive the expression for reflection coefficient of a transmission line. [7M]
 (OR)
4. a) Present the application of quarter wave transformer in impedance matching. [7M]
 b) Obtain the expressions for input impedance of i) open circuited transmission line and ii) short circuited transmission line. [7M]

UNIT-III

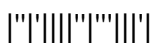
5. a) Derive Laplace's equation. [7M]
 b) Planes $x=2$ and $y = -3$, respectively carry charges 10nC/m^2 and 15nC/m^2 . Calculate \mathbf{E} at $(1,1,-1)$ due to these charge distributions. [7M]
 (OR)
6. a) Apply Gauss's law to find the \mathbf{E} due to an infinite sheet charge. [7M]
 b) Given the potential [7M]

$$V = \frac{10}{r^2} \sin \theta \cos \phi,$$

Find the electric flux density at $(2, \pi/2, 0)$.

UNIT-IV

7. a) Apply Ampere's law to find \mathbf{H} due to infinite line current. [7M]
 b) Given the magnetic vector potential $A = -\rho^2/4 \mathbf{a}_z \text{ Wb/m}$, calculate the total magnetic flux crossing the surface $\phi = \pi/2$, $1 \leq \rho \leq 5 \text{ m}$. [7M]
 (OR)
8. a) Obtain the expressions for transformer and motional EMFs. [7M]
 b) Write the Maxwell's equations in differential forms and also write the word statements of Maxwell's equation and explain. [7M]



UNIT-V

9. a) State and prove Poynting's theorem. [9M]
b) Discuss propagation of plane waves in Good conductors. [5M]
(OR)
10. a) A uniform plane wave in air with $\mathbf{E} = 8 \cos(\omega t - 4x - 3z) \mathbf{a}_y$ V/m is incident on a dielectric slab ($z \geq 0$) with $\mu_r = 1$ and $\epsilon_r = 2.5$, $\sigma = 0$. Find the reflected \mathbf{E} field. [6M]
b) Explain the terms Brewster angle, Skin depth, critical angle and total internal reflection. [8M]

