



Regulation R18

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 2P5DA

B.Tech V Semester Supplementary Examinations, January 2023

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

(ECE)

Maximum Marks: 70

06-08-2023

Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 State coulomb's law
- 2 Write the Maxwell's two equations for electrostatic fields?
- 3 State Bio-savart's law.
- 4 State Maxwell's equations for loss less or non-conducting medium.
- 5 What are good conductors and good dielectrics?
- 6 Define electromagnetic waves (or) EM waves?
- 7 List the different types of transmission lines.
- 8 How does group velocity vary when compared to phase velocity?
- 9 Define reflection coefficient.
- 10 What is single stub and double stub matching?

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 a) Explain the Gauss's law and derive the equations.
b) An infinitely long uniform line charge is located at $y=3$, $z=5$. If $\rho_L=30\text{nC/m}$, find field E intensity at (i) origin (ii) P (5, 6, 1). [5+5]

OR

12. a) State the Electric potential and Derive the relationship between Electric field and Electric potential?
b) Derive the "Poisson's and Laplace's" equation and mention their applications? [5+5]

- 13 a) Explain Biot-Savart's law and magnetic field intensity in different current distributions?
b) Explain the magnetic force on a charged particle and Lorentz force equation? [5+5]

OR

14. a) What is the inconsistency of Ampere's law?
b) State the Maxwell's equations in point form. [5+5]

- 15 a) State and Prove the Poynting theorem?
b) A Uniform plane wave at frequency of 9GHz travelling in a large block of dielectric ($\epsilon_r=55$,

$\mu_r=1$ and $\sigma=0.5$). Determine propagation constant, characteristic impedance and wave length? [5+5]

OR

- 16 a) Obtain the wave reflection by perfect conductor with normal incidence. What is Brewster angle?
b) What is polarization? Explain different types of polarization? [5+5]
- 17 a) Derive and explain the condition for minimum attenuation?
b) A transmission line operating at 500MHz has $Z_0=80\Omega$, $\alpha=0.04\text{Np/m}$ and $\beta=1.5\text{ rad/m}$. Find the line parameters R, L, G and C. [5+5]

OR

- 18 a) Derive secondary constants of Transmission line?
b) An open wire transmission line terminated in its characteristic impedance has the following primary constants at 1KHz, $R=6\Omega/\text{km}$, $L=2\text{mH}/\text{km}$, $G=0.5\text{mho}/\text{km}$ and $C=0.05\mu\text{F}/\text{km}$. Calculate α , β and phase velocity? [5+5]
- 19 a) Write short notes on UHF lines as circuit elements?
b) If a transmission line of characteristic impedance is 50 ohms is terminated in complex impedance $25+j100\Omega$. Find the reflection coefficient and VSWR of the line? [5+5]
- OR
- 20 a) Explain reflection coefficient and VSWR of a transmission line?
b) Write short notes on
i). $\lambda/8$ transformation.
ii). Significance of $Z_{\max}$ and $Z_{\min}$. [5+5]