



R22 Regulation

Subject code:4E4DE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Supplementary Examinations, December 2025

**ELECTROMAGNETIC THEORY AND TRANSMISSION LINES
(ECE)**

Maximum Marks: 60

Date:29.12.2025

Duration: 3 hours

- Note: 1.This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 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 (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	Express differential area and volume for cylindrical coordinate system.	1M	CO1	BL2
b)	Write down the expression for capacitance between two parallel plates.	1M	CO1	BL1
c)	State Biot-Savart's Law.	1M	CO2	BL1
d)	State the boundary conditions for magnetic fields.	1M	CO2	BL1
e)	In a certain medium $E = 10 \cos(10^8 t - 3y) a_x V/m$. Find the type of medium. (lossy, lossless, conducting or free space).	1M	CO3	BL2
f)	Define Brewster angle and Critical angle.	1M	CO3	BL1
g)	What is the Characteristic Impedance?	1M	CO4	BL1
h)	List the different types of Transmission lines	1M	CO4	BL1
i)	What happens when impedance is not matched?	1M	CO5	BL1
j)	Give the applications of smith chart.	1M	CO5	BL1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	a) Derive an expression of electric flux density for a surface charge using Coulomb's law.	5M	CO1	BL4
	b) A point charge 100 pC is located at (4, 1, -3) while the x-axis carries charge 2 nC/m. If the plane $z = 3$ also carries 5 nC/m ² . Find E at (1, 1, 1).	5M		
OR				
3	a) Define the potential difference and absolute potential. Give the relation between potential and field intensity.	5M	CO1	BL4
	b) A circular disc of 10 cm radius is charged uniformly with a total charge $10^{-10}C$. Find the electric field at a point 30 cm away from the disc along the axis.	5M		

4	Develop an equation for magnetic flux density at any point due to finite length of conductor.	10M	CO2	BL5
OR				
5	a) State and Explain the Faraday's laws in Electromagnetic induction. b) Show that the Displacement Current Density $J_D = \frac{\partial D}{\partial t}$.	5M 5M	CO2	BL2
6	a) Derive the Relation between E and H in free Space. b) Define the Conducting Medium and Obtain the Expression for Intrinsic impedance.	5M 5M	CO3	BL3
OR				
7	a) State and derive Poynting's theorem. b) In free space $H = 0.2 \cos(t\omega - \beta x) a_z A/m$. Find total power through: i. A square plate of side 10 cm on plane $x + z = 1$. ii. A circular disc of radius 5 cm on plane $x = 1$.	6M 4M	CO3	BL3
8	a) Define Transmission line and discuss the Primary Constants. b) An air line has a Characteristic Impedance of 70Ω and phase Constant of 3 rad/m at 100MHz. Calculate R, C and L.	5M 5M	CO4	BL3
OR				
9	A generator of 1 V, 1 kHz supplies power to 1000 km long open wire line terminated in Z_0 with the primary constants $R = 10.4 \Omega$, $L = 3.7mH$, $G = 0.5 \text{ } \mathcal{S}$, and $C = 0.00835 \mu F$. Calculate the: (i) Phase velocity. (ii) Characteristic impedance. (iii) Propagation constant. (iv) Power delivered at receiving end.	10M	CO4	BL3
10	a) A transmission line used to connect a transmitter to its antenna has a characteristic impedance $Z_0 = 50 \Omega$. The antenna with impedance $Z_L = (100+j75) \Omega$ is connected as a load. Calculate load reflection coefficient. b) Explain about the $\lambda/2$, $\lambda/4$, $\lambda/8$ transmission lines.	5M 5M	CO5	BL3
OR				
11	a) Explain the principal of single stub matching. b) Describe Smith chart and its salient features.	5M 5M	CO5	BL2