

R22 Regulation

Subject code: 4E4DE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech IV Semester Regular/Supplementary Examinations, April 2025

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

(ECE)

Maximum Marks: 60

Date: 12.05.2025

Duration: 3 hours

- Notes:**
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 contains 6/5 Units. Answer any two full questions from each unit.
 4. Each question carries 10 marks and any two a, b, c, d as each question.

Part-A

All the following questions carry equal marks

(10X1M=10 Marks)

	Marks	CO	Bloom Tx
1.a) Give the relation between E and B?	1M	1	L1
b) List the different types of coordinate systems.	1M		L2
c) Define Magnetic flux density?	1M	2	L1
d) Give the expressions for all two Maxwell's equations.	1M	2	L2
e) Define skin depth.	1M	3	L1
f) Define Surface impedance?	1M	3	L1
g) Define transmission line.	1M	4	L1
h) Give the condition for lossless transmission line.	1M	4	L2
i) What is OC and SC transmission line?	1M	4	L2
j) List the 4 locations of Smith chart.	1M	4	L2

Part-B

Answer All the following questions.

(5X10M=50Marks)

	Marks	CO	Bloom Tx
1	3M		
a) State and prove Coulomb's law.			
b) Point charges 1 nC and -2nC are located at (3, 2, -1) and (-1, -1, 4) respectively. Calculate the electric force on a 10nC charge located at (0, 3, 1).	4M	1	L3
c) Explain Electric field intensity due to a line charge.	3M		
2			
Derive continuity equation and relaxation time from fundamentals.	10M	1	L3
3			
a) State and explain Biot-Savart's law.	5M		
b) A charge of 12C has velocity of $3\mathbf{a}_x + 2\mathbf{a}_y - 3\mathbf{a}_z$ m/s. Determine $\mathbf{F}$ on the charge in the field of (a) $\mathbf{E} = 12\mathbf{a}_x + 3\mathbf{a}_y + 12\mathbf{a}_z$ V/m (b) $\mathbf{B} = 4\mathbf{a}_x + 4\mathbf{a}_y + 3\mathbf{a}_z$ Wb/m ² .	5M	2	L3
4			
OR			
5	10M	2	L3
State and prove the Maxwell's equations for magnetostatic fields.			
6	5M	3	L3
a) Derive the expressions for attenuation and phase constants in good dielectrics.			
b) Derive the expressions for skin depth of conductor.	5M		

	OR			
7	a) A y polarized uniform plane with fields (E_0, H_0) and a frequency of 100MHz propagates in air in the + x-direction and impinges normally on a perfectly conducting plane at $x=0$, assuming the amplitudes of E_0 to be 6mV/m. Write the phasor and instantaneous expression for the following : 1) E_i and H_i of the incident wave 2) E_r and H_r of the reflected wave E_t and H_t of the total wave in air. b) State and Prove Poynting theorem.	4M 6M	3	L3
8	a) What are different types of transmission lines? b) What are primary and secondary constants? c) List out the characteristics of lossless transmission line?	3M 3M 4M	4	L2
	OR			
9	A transmission line in which no distortion is present has the following parameters $Z_0 = 50\Omega$, $\alpha = 0.020m^{-1}$, $\theta = 0.6\theta_0$. Determine R, L, G, C and wavelength at 0.1GHz.	10M	4	L3
10	Explain about $\frac{\lambda}{2}$, $\frac{\lambda}{4}$ and $\frac{\lambda}{8}$ transmission lines.	10M	4	L2
	OR			
11	Derive the expressions of the following for a transmission line a. Reflection coefficient b. Standing wave ratio	5M 5M	4	L2