



R22 Regulation

Subject code:4E6DA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, November 2025

ANTENNAS AND WAVE PROPAGATION (ECE)

Maximum Marks: 60

Date: 19.11.2025

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)	What is meant by front to back ratio?	1M	CO1	BT1
b)	Define effective aperture (area) of an antenna.	1M	CO1	BT1
c)	What are parasitic elements and where are they used?	1M	CO2	BT1
d)	Calculate the power gain of an optimum horn antenna approximately with a square aperture of 10λ on a side.	1M	CO2	BT2
e)	List the applications of MSA.	1M	CO3	BT1
f)	Name the types of reflectors.	1M	CO3	BT1
g)	Write the disadvantages of binomial arrays.	1M	CO4	BT1
h)	Give the sources of error while measuring the antenna parameters.	1M	CO4	BT2
i)	What is meant by wave tilt in ground wave propagation?	1M	CO5	BT1
j)	What is Virtual Height?	1M	CO5	BT1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Derive expression for Electric and Magnetic Field radiated by Half Wave Dipole and Sketch its Field Strength pattern.	10M	CO1	BT3
OR				
3	a) Compare fields of small loop and short dipole. b) Derive the expression for radiation resistance of small loop antenna.	5M 5M	CO1	BT3
4	a) Explain Yagi-Uda antenna in detail. b) Design Yagi-Uda antenna of six elements to provide a gain of 12db if the operating frequency is 200 MHz.	5M 5M	CO2	BT3
OR				
5	Distinguish between the axial and normal modes of radiation characteristics of a helical Antenna and identify their requirements.	10M	CO2	BT3
6	a) Give the expressions for impedance, bandwidth and directivity of rectangular patch antenna.	5M	CO3	BT3

	b) Design a rectangular microstrip antenna using a substrate with a dielectric constant of 2.2, height $h=0.1588$ cm so as to resonate at 10 GHz.	5M		
	OR			
7	a) Discuss the application of image antenna concept to the 90° corner reflector. b) Explain about flat sheet, corner and paraboloidal reflectors.	5M 5M	CO3	BT3
8	a) A broad side array operating at 10 cm wavelength consists of 4 half wave dipole spaced 50 cm each element carries radio frequency current in the same phase and of magnitude 0.5 amps. Calculate the radiated power, half width of major lobe. b) Compare End fire and Broadside array.	5M 5M	CO4	BT4
	OR			
9	a) Derive the expression for far field pattern of an array of two isotropic points sources at equal amplitude & opposite phase. b) Explain near and far fields with respect to antenna measurements.	5M 5M	CO4	BT3
10	a) Discuss the field strength variation with skip distance & virtual height. b) Show that the radius of curvature of ray path is given by $2/(d\epsilon/dh)$ for tropospheric waves.	5M 5M	CO5	BT4
	OR			
11	a) It is required to establish a short wave communication between two points in earth's surface separated by 1200 km. Calculate the f_{MUF} and angle of take off the transmitted wave from the following data. Highest signal frequency return to earth after vertically upward propagation is 7.10MHz and virtual height of ionized layer is 200 km. Assume surface of earth to be flat. b) Explain the refraction and reflection mechanisms in sky wave propagation.	5M 5M	CO5	BT5