Hall Ticket Number:

Code No. : 15451 N

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.C.E.) V-Semester Main Examinations, Jan./Feb.-2024

Antenna and Wave Propagation

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO/PSO
1.	What are θ and ϕ patterns of an antenna radiation pattern	2	1	1	1, PSO2
2.	Express the relation between radiation intensity and power density	2	1	1	2, PSO2
3.	Calculate the efficiency and directivity of the antenna in dB with radiation resistance of 73Ω and a loss resistance of 7Ω and the power gain is 20.	2	3	2	2, PSO2
4.	Why antenna measurements are usually done in fraunhofer zone?	2	1	2	1, PSO2
5.	What is pattern multiplication?	2	1	3	1, PSO2
6.	Write the condition for broad side radiation in arrays?	2	2	3	1, PSO2
7.	Comment on the direction of radiation of helical antenna in axial mode?	2	1	4	1, PSO2
8.	List any two limitations of log periodic antenna?	2	1	4	1, PSO2
9.	Calculate the LOS distance between the transmitting and receiving antennas of height 170m and 35m in space wave propagation.	2	3	5	2, PSO2
10.	What is the critical frequency with maximum density of the ionosphere corresponds to a refractive index of 0.8 at 15 MHz operating frequency.	2	3	5	2, PSO2
	Part-B (5 × 8 = 40 Marks)				
11. a)	Explain the following antenna parameters with suitable sketches. i. Power density iii. Radiation pattern ii. Gain iv. Effective aperture area	4	1	1	1, PSO2
b)	Prove that the infinitesimal electric dipole centered at the origin and lies along z-axis radiates with magnetic field only on ϕ plane	4	2	1	2, PSO2
12. a)	Explain the concept of Retarded potentials in antenna analysis with relevant expressions	4	2	2	1, PSO2
b)	Analyze and evaluate the electric field and magnetic field components of half wave dipole antenna using Maxwell's equations	4	4	2	2, PSO2

Contd... 2

13. a)	Develop the mathematical expression for array factor of N-element linear antenna array formed using point isotropic antennas	5	3	3	2, PSO2
b)	A half wavelength dipole is kept in the XY plane and oriented along 45^0 from the x-axis. Determine the direction of null in the radiation pattern for $0 \leq \emptyset \leq \pi$	3	4	3	2, PSO2
14. a)	Design a rectangular micro-strip patch antenna radiating at 10 GHz using FR4 material as substrate with thickness of 3.2 mm and relative permittivity as 4.2	4	4	4	2, PSO2
b)	Explain the principle and operation of a parabolic antenna at high frequencies	4	2	4	1, PSO2
15. a)	Explain about significance and benefits of smart antennas?	4	2	5	1, PSO2
b)	Categorize different modes of wave propagation and explain the ionosphere propagation	4	2	5	1, PSO2
16. a)	Explain the concept of ground effects related to antenna performance	4	2	1	1, PSO2
b)	Formulate the expression of power received in terms of power transmitted, distance of separation between the transmitting and receiving antennas and other directional parameters. Assume free space conditions.	4	3	2	2, PSO2
17.	Answer any ***two*** of the following:				
a)	Explain about the radiation pattern of 2-point isotropic antenna array with equal excitation amplitude and phase	4	3	3	1, PSO2
b)	Design Yagi-Uda antenna with 3 elements for receiving the frequency at 35MHz.	4	3	4	2, PSO2
c)	Differentiate between electromagnetic interference and electromagnetic compatibility	4	2	5	1, PSO2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	37.5%
iii)	Blooms Taxonomy Level – 3 & 4	42.5%

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