Hall Ticket No | | | | | | | | | | | Question Paper Code: AEC011

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

B.Tech V Semester End Examinations, December - 2019

Regulation: IARE-R16

ANTENNAS AND PROPAGATION

(Electronics and Communication Engineering)

Time: 3 Hours **Max Marks: 70**

Answer any ONE question from each Unit
All questions carry equal marks
All parts of the question must be answered in one place only

UNIT – I

1	a)	Derive an expression for the power radiated by the current element and calculate the radiation resistance.	[7M]
	b)	Derive the FRIIS transmission formula and explain its significance with the help of block diagrams	[7M]
2	a)	Derive the total power radiated by half wave dipole. Sketch the radiation pattern and point out the angles.	[7M]
	b)	Show that the radiation resistance of a half wave dipole is $80\pi^2\left(\frac{dl}{\lambda}\right)^2$ ohms.	[7M]

UNIT – II

3	a)	Derive the expression for the far field pattern of an array of 2 – isotropic point sources i) Equal amplitude and phase ii) Equal amplitude and opposite phase	[7M]
	b)	Explain in detail the working principle of Helical antenna in (a) Normal mode (b) Axial mode	[7M]
4	a)	Derive the expression for far field components of a small loop antenna with the help of neat diagram.	[7M]
	b)	Obtain the expression for the emf due to loop antenna and explain its use as a Direction finder	[7M]

UNIT – III

5	a)	Obtain the design equations of horn antenna and discuss the various forms of horn antenna	[7M]
	b)	Find the directivity of 10 turn helix antenna having pitch angle 100 , circumference C equal to λ and draw the helical antenna with geometry.	[7M]
6	a)	Describe the characteristics of broadband microstrip patch antenna and its applications?	[7M]
	b)	Explain the radiation mechanism of a micro strip antenna with suitable diagrams.	[7M]

UNIT – IV

7	a)	A parabolic dish antenna provides a gain of 75dB at a frequency of 15GHz. Calculate the capture area, HPBW and FNBW	[7M]
	b)	Explain the principle of parabolic reflector antenna and discuss different types of feeds using with neat diagram.	[7M]
8	a)	With neat block diagram explain the radiation pattern measurement for measuring the radiation intensity of an antenna and describe the limitations.	[7M]
	b)	The diameter of parabolic reflector is 2m. For operation at 6GHz, find the beam width between first nulls and the gain.	[7M]

UNIT – V

9	a)	With a neat sketch explain the mechanism of space wave propagation over ideal flat earth.	[7M]
	b)	Derive the field strength equation at a distance in space wave propagation	[7M]
10	a)	Derive the relation between Maximum usable frequency (MUF) and skip distance.	[7M]
	b)	Explain the phenomenon of ducting? What are the conditions required for manifestation of this phenomenon	[7M]

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COURSE OBJECTIVES:

The course should enable the students to:

I	Be Proficient in the radiation phenomena associated with various types of antennas and understand basic terminology and concepts of antennas along with emphasis on their applications.
II	Analyze the electric and magnetic field emission from various basic antennas with mathematical formulation of the analysis.
III	Explain radiation mechanism of different types of antennas and their usage in real time field.
IV	Justify the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

COURSE OUTCOMES:

CO 1	Describe the concept of probability, conditional probability, Baye's theorem and analyze the concepts of discrete, continuous random variables
CO 2	Determine the binomial, poisson and normal distribution to find mean, variance.
CO 3	Understand multiple random variables and enumerate correlation and regression to the given data.
CO 4	Explore the concept of sampling distribution and apply testing of hypothesis for sample means and proportions.
CO 5	Use t-test for means, F-test for variances and chi-square test for independence to determine whether there is a significant relationship between two categorical variables.

COURSE LEARNING OUTCOMES:

AEC011.01	Discuss about the radiation mechanism in single wire, double wire antennas and the current distribution of thin wire antenna.
AEC011.02	Discuss the different parameters of an antenna like radiation patterns, radiation intensity, beam efficiency, directivity and gain etc.
AEC011.03	Analyze the concept of antenna properties based on reciprocity theorem; evaluate the field components of quarter wave monopole and half wave dipole.
AEC011.04	Understand the significance of loop antennas in high frequency range and its types; derive their radiation resistances and directivities.
AEC011.05	Discuss the uniform linear arrays such as broadside array and yagi array, derive their characteristics.
AEC011.06	Analyze the practical design considerations of monofilar helical antenna in axial and normal modes.
AEC011.07	Discuss the various types of Microwave antennas and analyze the design consideration of pyramidal horn.

AEC011.08	Analyze the concept of complementary in slot antennas using Babinet's principle and understand the impedance of slot antennas.
AEC011.09	Understand the significance, features and characteristics of micro strip patch antennas, analyze the impact of different parameters on characteristics.
AEC011.10	Understand and analyze the reflectors are widely used to modify the radiation pattern as a radiating element, its types.
AEC011.11	Discuss various concepts related to antennas such as feed methods like front feed, rear feed, offset feed and aperture blockage.
AEC011.12	Discuss various methods and techniques for experimental measurements of antennas such as pattern measurement, directivity measurement, gain measurement etc.
AEC011.13	Understand the wave propagation through the complete study of the wave by the nature and characteristics of media during the wave travels.
AEC011.14	Understand the space wave propagation focusing on field strength variation with distance and height, effect of earth's curvature, absorption and super refraction.
AEC011.15	Analyze the structure of ionosphere and understand the sky wave propagation through refraction and reflection by ionosphere.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES:

SEE Question No.		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	AEC011.01	Discuss about the radiation mechanism in single wire, double wire antennas and the current distribution of thin wire antenna.	CO 1	Understand
	b	AEC011.02	Discuss the different parameters of an antenna like radiation patterns, radiation intensity, beam efficiency, directivity and gain etc.	CO 1	Understand
2	a	AEC011.01	Discuss about the radiation mechanism in single wire, double wire antennas and the current distribution of thin wire antenna.	CO 1	Understand
	b	AEC011.01	Discuss about the radiation mechanism in single wire, double wire antennas and the current distribution of thin wire antenna.	CO 1	Understand
3	a	AEC011.05	Discuss the uniform linear arrays such as broadside array and yagi array, derive their characteristics.	CO 2	Understand
	b	AEC011.06	Analyze the practical design considerations of monofilar helical antenna in axial and normal modes.	CO 2	Understand
4	a	AEC011.04	Understand the significance of loop antennas in high frequency range and its types; derive their radiation resistances and directivities	CO 2	Understand
	b	AEC011.04	Understand the significance of loop antennas in high frequency range and its types; derive their radiation resistances and directivities	CO 2	Remember
5	a	AEC011.07	Discuss the various types of Microwave antennas and analyze the design consideration of pyramidal horn.	CO 3	Understand
	b	AEC011.07	Discuss the various types of Microwave antennas and analyze the design consideration of pyramidal horn.	CO 3	Remember

6	a	AEC011.09 .	Understand the significance, features and characteristics of micro strip patch antennas, analyze the impact of different parameters on characteristics.	CO 3	Understand
	b	AEC011.09	Understand the significance, features and characteristics of micro strip patch antennas, analyze the impact of different parameters on characteristics.	CO 3	Understand
7	a	AEC011.11	Discuss various concepts related to antennas such as feed methods like front feed, rear feed, offset feed and aperture blockage.	CO 4	Understand
	b	AEC011.11	Discuss various concepts related to antennas such as feed methods like front feed, rear feed, offset feed and aperture blockage.	CO 4	Understand
8	a	AEC011.12	Discuss various methods and techniques for experimental measurements of antennas such as pattern measurement, directivity measurement, gain measurement etc.	CO 4	Understand
	b	AEC011.11	Discuss various concepts related to antennas such as feed methods like front feed, rear feed, offset feed and aperture blockage.	CO 4	Understand
9	a	AEC011.14	Understand the space wave propagation focusing on field strength variation with distance and height	CO 5	Understand
	b	AEC011.14	Understand the space wave propagation focusing on field strength variation with distance and height	CO 5	Remember
10	a	AEC011.15	Analyze the structure of ionosphere and understand the sky wave propagation through refraction and reflection by ionosphere.	CO 5	Understand
	b	AEC011.15	Analyze the structure of ionosphere and understand the sky wave propagation through refraction and reflection by ionosphere.	CO 5	Remember

Signature of Course Coordinator **HOD,ECE.**