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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-I

B.Tech V Semester End Examinations,November - 2019

Regulations: 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)	Starting from basic equations of electromagnetic field, derive the radiated power and radiation resistance of a current element?	[7M]
	b)	Prove the reciprocity theorem as applicable to antennas and hence show the equality of directional pattern for transmission and reception by same antenna	[7M]
2	a)	Derive the expression for radiation fields of a centre fed half wavelength dipole antenna. Sketch the radiation pattern and point out the angles.	[7M]
	b)	Describe the radiation resistance of antenna and Derive the expression for radiation resistance of half wave length dipole antenna	[7M]

UNIT - II

3	a)	Derive the construction and basic principles of operation of a helical antenna under (i) normal mode of operation (ii) axial mode of operation	[7M]
	b)	Draw the sketch of Yagi Uda array antenna. Prove how the longer antenna behind the main antenna behaves as a reflector and the shorter antenna in front of main antenna acts as a director	[7M]
4	a)	Describe the binomial array antenna and its basic principle of working,Mention the advantages and disadvantages.	[7M]
	b)	Derive the field equations from a small loop antenna and Compare far fields of small loop antenna and short dipole antenna.	[7M]

UNIT – III

5	a)	Describe the electromagnetic horn antenna,Classify the various types of horn and their practical applications?	[7M]
	b)	Describe the principle of equality of path length and How is it applicable to Horn antennas? Obtain an expression for the directivity of a pyramidal horn in terms of its aperture dimensions.	[7M]
6	a)	Design Pyramidal horn antenna with dimensions a=2.286cm and b=1.016cm operating at afrequency 11GHz and gain is 22.6dB.	[7M]
	b)	Draw and explain the slot antenna with working principle .Draw its radiation pattern	[7M]

UNIT – IV

7	a)	With reference to paraboloids, explain the following: i) f/D ratio ii) Spill over and aperture efficiency iii) Front to back ratio iv) Types of feeds.	[7M]
	b)	Describe the Reflector antenna, Classify and draw the various types of Reflector antenna and their practical applications?	[7M]
8	a)	A Paraboloid reflector antenna is designed for operation at3GHz.Its largest aperture dimension is 20feet. For measurement of radiation pattern what should be minimum distance betwen primary and secondary antenna.	[7M]
	b)	With neat block diagram explain the Gain comparison method for measuring the gain of an antenna and describe the limitations.	[7M]

UNIT – V

9	a)	Describe any two types of fading normally encountered in radio wave propagation.How are the problems of fading overcome?	[7M]
	b)	Determine the change in the electron density of E-layer when the critical frequency changes from 4 MHz to 1 MHz between mid -day and sun-set.	[7M]
10	a)	Write a short notes on following: i) MUF ii) Virtual Height iii) Wave tilt iv) Multihop Transmission.	[7M]
	b)	Discuss in detail about experimental determination of virtual heights and critical frequencies.Relate critical frequency with maximum usable frequency.	[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	AEC011.03	Analyze the concept of antenna properties based on reciprocity theorem; evaluate the field components of quarter wave monopole and half wave dipole.	CO 1	Understand
2	a	AEC011.02	Discuss the different parameters of an antenna like radiation patterns	CO 1	Understand
	b	AEC011.02	Discuss the different parameters of an antenna like radiation patterns	CO 1	Understand
3	a	AEC011.06	Analyze the practical design considerations of monofilar helical antenna in axial and normal modes.	CO 2	Understand
	b	AEC011.05	Discuss the uniform linear arrays such as broadside array and yagi array	CO 2	Understand
4	a	AEC011.05	Discuss the uniform linear arrays such as broadside array and yagi array	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	AEC011.07 .	Discuss the various types of Microwave antennas and analyze the design consideration of pyramidal horn.	CO 3	Understand
	b	AEC011.08	Analyze the concept of complementary in slot antennas using Babinet's principle and understand the impedance of slot antennas.	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	AEC011.10	Understand and analyze the reflectors are widely used to modify the radiation pattern as a radiating element, its types.	CO 4	Understand
8	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	AEC011.12	Discuss various methods and techniques for experimental measurements of antennas such as pattern measurement, directivity measurement, gain measurement etc.	CO 4	Understand
9	a	AEC011.13	Understand the wave propagation through the complete study of the wave by the nature and characteristics of media during the wave travels.	CO 5	Understand
	b	AEC011.15	Analyze the structure of ionosphere and understand the sky wave propagation through	CO 5	Remember

			refraction and reflection by ionosphere.		
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**