Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: EC306

Course Name: ANTENNA AND WAVE PROPAGATION (EC)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

1 a) State and Prove Reciprocity Theorem as applied to Antennas. (8)

b) Explain the concept of retarded potentials. (4)

c) Define Antennae Temperature. (3)

2 a) Derive expressions for the Far Field components and Radiation Resistance of a half wave dipole. (12)

b) Define Gain and Directivity of an antenna. (3)

3 a) Derive expressions for beam solid angle in terms of Directivity of an Antenna. (4)

b) Distinguish between Effective Aperture and Physical Aperture of an antenna. (4)

c) Draw an experimental setup and explain how radiation pattern measurement of an antenna is carried out. (7)

PART B

Answer any two full questions, each carries 15 marks.

4 a) State the Principle of Pattern multiplication. Explain and illustrate the principle with an N element array. (7)

b) With a neat diagram explain the principle of operation of a Horn antenna (4)

c) Explain the importance of Cassegrain Antennae. (4)

5 a) Derive expressions for array factor of an N element linear uniform array and obtain its maximum value. (6)

b) Explain the construction and working of Rhombic Antenna (6)

c) Explain the basic Principle of Beam Steering. (3)

6 a) Design a broadside Dolph –Tschebyscheff array of 8 elements with spacing of d= $\lambda/2$ between the elements and major to minor lobe ratio of 25 dB. (10)

b) Derive expressions and plot the pattern for the field radiated by two isotropic point sources fed with current of same magnitude and phase. (5)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Explain the axial mode and normal mode of operation of a helical antenna. (6)

b) A television transmitting antenna mounted at a height of 120m radiates 15kW of power equally in all directions in azimuth at a frequency of 50MHz .Calculate (i) maximum line of sight range (ii) the field strength at a receiving antenna mounted at a height of 16 m at a distance of 12 km and (iii) distance at which the field strength reduces to 1mV/m. (8)

c) Explain Tropospheric scatter propagation. (6)

8 a) Design a rectangular microstrip antenna using a substrate with a dielectric constant of 2.25 and operating at 9 GHz. Take Height of Substrate (h = 0.16 cm). (10)

b) Derive an expression for the LOS distance in km when the antenna heights above ground are h_t and h_r respectively for the transmitter and receiver Antenna. (5)

c) Differentiate between critical frequency and maximum usable frequency. (5)

9 a) With the help of neat diagrams explain the principle of operation of Log Periodic Antenna. (8)

b) What are the requirements for an antenna used in a mobile handset? Give some typical antennas used in cellular handsets. (6)

c) Explain the diversity techniques employed in wave reception. (6)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: EC306

Course Name: Antenna & Wave Propagation

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks Marks

1 a) Define beam solid angle and directivity of an antenna 9

b) Draw the equivalent circuit of a receiver antenna 6

2 a) Derive expression for far field pattern of a half wave dipole antenna and find position of Nulls and BWFN. 10

b) Explain any one method of gain measurement of an antenna 5

3 a A transmitter antenna transmits 10watt power at 100Mhz with efficiency 80%. The gain of the transmitter antenna is 3. The receiver antenna is at a distance 5km from transmitter which is identical to transmitter. The effective length of receiver antenna is 0.3λ .Calculate 8

a) The power density at the receiver antenna

b) Electric field intensity at the receiver antenna.

c) The power received by the receiver antenna.

d) The voltage induced at the input terminal of the antenna

b Explain the concept of retarded potential 7

4 Plot the radiation pattern of a 4 element linear broadside array with isotropic point sources with spacing $d = \frac{\lambda}{4}$. Find BWFN of the array, 15

5 a) With necessary equations explain the principle of beam steering 10

b) Explain binomial array 5

6 a) Explain the working of a rhombic antenna 10

b) Explain the principle of pattern multiplication 5

7		Explain rectangular micro strip patch antenna and explain its design steps.	20
8		Derive expression for effective refractive index, critical frequency , maximum usable frequency and skip distance (assuming flat earth's surface) for sky wave propagation	20
9	a)	Explain normal mode and axial mode helical antenna	(10)
	b)	Derive expression for line of sight distance for space wave propagation assuming effective radius of earth,	(10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: EC306

Course Name: Antenna & Wave Propagation

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks

			Marks
1	a)	Define Radiation resistance, HPBW, and effective length of an antenna	(7)
	b)	Derive the expressions for far field pattern Electric and Magnetic fields of a short dipole excited with constant current. Derive expression for directivity of the short dipole antenna.	(8)
2	a)	Explain antenna temperature.	(8)
	b)	Derive reciprocity theorem for antennas.	(7)
3	a)	Explain the procedure involved in the radiation gain measurement of antenna	(8)
	b)	Explain how the input impedance of an antenna is measured.	(7)

PART B

Answer any two full questions, each carries 15 marks

4		Derive expression for array factor of N isotropic sources for end-fire array. Derive expression for major lobe, minor lobes and Nulls of the array.	15
5		a)Design a 5 element Dolph-Chebyshev array with peak side lobe level 19.5dB	(10)
		b) Explain the working of V antenna	(5)
6	a)	Explain the working of a parabolic dish antenna. Write down the expression for gain, HPBW and BWFN	(7)
	b)	Explain the working of a rhombic antenna and it uses.	(8)

PART C

Answer any two full questions, each carries 20 marks

7	(a)	Explain the working of a log periodic dipole array and explain it's design steps.	(15)
	b)	Explain ground wave propagation	(5)
8	a)	Explain axial mode helical antenna. Write down the expression for gain ,HPBW,BWFN and radiation resistance of axial mode helical antenna.	(12)
	b)	Neglecting the effect of earth's magnetic field derive expression for refractive index of ionosphere.	(8)
9		Derive expression for line of sight distance and received field strength for space wave propagation	(20)

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth semester B.Tech degree examinations (S), September 2020

Course Code: EC306

Course Name:Antenna & Wave Propagation

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks Marks

1 a) With a neat diagram of the experimental setup, explain how radiation pattern measurement of anantenna is carried out. (10)

b) Explain antenna field zones (5)

2 a) Derive expressions for the Far Field components and Radiation Resistance of a short dipole antenna. (12)

b) Calculate the effective aperture of a short dipole antenna operating at 100 MHz. (3)

3 a) State and Prove Reciprocity Theorem. (7)

b) The radiation intensity of the major lobe of an antenna is represented by (8)

$U = A_0 \cos\theta, \ 0 < \theta < \frac{\pi}{2}, \quad 0 < \Phi < 2\pi$

Find the maximum directivity?

PART B

Answer any two full questions, each carries 15 marks

4 a) Explain the working of a rhombic antenna and its applications. (8)

b) Explain the working of V antenna. (7)

5 a) Design a Dolph –Tschebyscheff array of 10 elements with spacing of d = λ/2 between the elements and major to minor lobe ratio is 26 dB. (15)

6 a) Derive expression for directions of pattern maxima, pattern minima and HPBW for a endfire array of 'n' elements. (10)

b) With neat diagrams explain the principle of operation of a Horn antenna. (5)

PART C

Answer any two full questions, each carries 20 marks

7 a) With detailed diagrams explain the structure and modes of operation of helical antenna. (12)

b) Explain duct propagation. (8)

8 a) Define Critical frequency and Maximum usable frequency. (5)

	b)	With the help of neat diagrams explain the principle of operation of Log PeriodicAntenna.	(10)
	c)	Explain Tropospheric scatter propagation.	(5)
9	a)	Design a rectangular microstrip antenna using a dielectric substrate with dielectric constant of 2.2, h = 0.1588 cm so as to resonate at 10 GHz.	(15)
	b)	What is fading. Explain the diversity techniques adopted in wave propagation.	(5)

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