

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 (10) assuming effective radius of earth,

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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

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|---|----|---|-----|
| 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

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|---|----|---|------|
| 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

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|---|-----|---|------|
| 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) |

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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 an antenna 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 $U = A_0 \cos \theta$, $0 < \theta < \frac{\pi}{2}$, $0 < \Phi < 2\pi$ (8)
- 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 $d = \lambda/2$ 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 Periodic Antenna. (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)
