Code No: R1631045 **R16** SET - 1

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021

ANTENNA AND WAVE PROPAGATION

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) Define beam efficiency of an antenna. [2M]
   b) What are short Antennas and list out various types? [2M]
   c) Explain three different types of arrays with regard to beam pointing direction. [2M]
   d) Describe the advantages and limitations of patch antennas. [3M]
   e) What is the significance of zoning in lens antennas? [3M]
   f) Define f_c and f_{muf}. [2M]

PART –B (56 Marks)

2. a) Define Directivity and Power Gain of an Antenna. Estimate power gain (G_p) if R_{loss}=10 ohms, R_{rad}= 0 ohms and D = 100. [7M]
   b) What are principle planes? How the Antenna Beam Width is defined in such planes? [7M]

3. a) Define the terms: i) Radial power flow, ii) Radiation resistance for a short dipole, and iii) Uniform current distribution. [7M]
   b) Obtain the relative amplitudes of radiation, induction and electro-static fields at a distance of 2λ from a short current element having a uniform current of 1 mA along its length. [7M]

4. a) Find the radiation pattern of 4 isotropic elements fed in phase, spaced λ/2 apart by using pattern multiplication. [7M]
   b) What are the advantages and disadvantages of binominal array and design 3 element binomial arrays. [7M]

5. a) Explain the designing of rectangular micro strip antenna. [7M]
   b) Define axial ratio and their significance in helical antenna. [7M]

6. a) Explain the gain measurement of an antenna by comparison method. [7M]
   b) Write short notes on Cassegrain antennas with neat diagrams. [7M]

7. a) Discuss the importance of ground wave propagation for communication purpose. [7M]
   b) What is wave tilt and how does it affect the field strength received at a distance from the transmitter? [7M]

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Code No: R1631045 **R16** SET - 2

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021

ANTENNA AND WAVE PROPAGATION

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) Find beam area if half power beam widths are 60^0 and 30^0 on the two Principal planes. [2M]
   b) Draw the polar and rectangular approximate radiation pattern for the given specifications. Number of major lobes -1, back lobe-1, sidelobes-4, FBR=10, SLR=13.5dB. [3M]
   c) Draw the structure of Yagi-Uda antenna and give the specifications of elements. [2M]
   d) Classify the modes of helical antenna based on size. [2M]
   e) Define Pyramidal Horn antenna. [3M]
   f) Define critical angle and LOS. [2M]

PART –B (56 Marks)

2. a) Find directivity, efficiency and effective area of an antenna if it's R_{rad}=80Ω, R_{Loss}=20Ω. The power gain is 10dB and antenna operating frequency is 100 MHz. [7M]
   b) Explain the working principle of a two-wire antenna. [7M]

3. a) Using necessary equations, estimate the directivity of a Quarter wave Monopole antenna. [7M]
   b) What is the effective area of a half-wave dipole operating at 200 MHz? [7M]

4. a) Estimate the resultant radiation pattern of N=8 element linear uniform distributed array using pattern multiplication. [7M]
   b) A uniform linear array is required to produce an end-fire beam when it is operated at a frequency of 10 GHz. It contains 50 radiators and Spaced at 0.5λ. Find the progressive phase shift required to produce the end-fire beam. [7M]

5. a) Design a microstrip antenna at operating frequency of 2 GHz and ε_r =2.2. Assume any other required data. [7M]
   b) Explain the principle of long wire antenna with their equations. [7M]

6. a) Explain the need of Offset feed technique in parabolic antennas. Discuss the types of offset feed. [7M]
   b) What is the power gain of a paraboloid reflector whose mouth diameter is equal to 8λ? [7M]

7. a) A communication system is to be established at a frequency of 60 MHz with a transmitter power of 1 kW. The field strength of the Directive antenna is 3 times that of a half-wave antenna. h_t= 50m. Field strength of 80μV/m is required to give satisfactory reception. Find the range of the system. [7M]
   b) Define MUF and skip distance. [7M]

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Code No: R1631045 **R16** SET - 3

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021

ANTENNA AND WAVE PROPAGATION

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) Define effective length of an antenna. [2M]
   b) Obtain the directivity of a short dipole antenna. [2M]
   c) Explain the principle of multiplication of patterns. [3M]
   d) Explain the significance of terminating resistance and input resistance of travelling wave antenna. [2M]
   e) With reference to paraboloids, explain the Aperture efficiency. [2M]
   f) Write short notes on Optimum working frequency and LUHF. [3M]

PART –B (56 Marks)

2. a) Explain the following : [7M]
   i) Normalized field pattern, ii) Beam solid Angle, iii) Beam Efficiency, iv) Directivity.
   b) Show that the aperture area for a Hertzian dipole is 0.12 λ^2, for a half wave dipole is 0.13 λ^2, and for an isotropic is 0.08 λ^2. [7M]

3. a) State and explain the Reciprocity Theorem for antennas. [7M]
   b) Explain how loop aerial is used for direction Finding? Derive the relevant expression for electric field intensity for loop aerial. [7M]

4. a) Derive the conditions for the linear array of 'N' isotropic elements to radiate in end-fire and broad-side mode and find the first two side lobe levels. [7M]
   b) List the various differences between bi-nomial and linear arrays. [7M]

5. a) Explain the the configuration of a Folded Dipole Antenna. Sketch its radiation pattern. [7M]
   b) What are the various modes of working of helical antenna? Explain the working principle of helical antenna in normal mode. [7M]

6. a) What is the principle of equality of path length? How it is applicable to horn antenna? Obtain an expression for the directivity of pyramidal horn in terms of its aperture dimensions. [7M]
   b) How is the field pattern of the ''Receiving Antenna" experimentally determined? Explain it with a neat block diagram. [7M]

7. a) In case of ionosphere, explain the significance of D, E and F layers. [7M]
   b) Discuss the phenomenon of space wave propagation. [7M]

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Code No: R1631045 **R16** SET - 4

III B. Tech I Semester Regular/Supplementary Examinations, March – 2021

ANTENNA AND WAVE PROPAGATION

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) Define the term resolution of an antenna. [2M]
   b) What is short magnetic dipole? [2M]
   c) Describe the concept of scanning arrays. [2M]
   d) Explain the significance of Yagi-Uda. [3M]
   e) What do you mean by F/D ratio? [2M]
   f) Write short notes on Ionospheric abnormalities. [3M]

PART –B (56 Marks)

2. a) Define gain, power gain, directive gain and directivity of an antenna. Prove that the directivity of a $\lambda/2$ dipole is 2.15 dB. [7M]
   b) Calculate the electric filed(E_{rms}) due to an isotropic radiator radiating 1 kW power at a distance of 1 Km from it. [7M]

3. a) Define the terms electrostatic field, induction field, and radiation field of an antenna and bring out their significance. [7M]
   b) Sketch and compare radiation patterns of horizontal half wave dipole with those of vertical half wave dipole. [7M]

4. a) A linear broad side array consists of 4 equal elements in phase point sources with $\lambda/2$ spacing. Calculate field pattern. Find the directivity and beam width. [7M]
   b) Distinguish between ordinary End-fire array and Broad side array. [7M]

5. a) List out the types of patch shapes and feeding techniques of microstrip antenna. Explain the importance of Dielectric in MSA. [7M]
   b) Explain the reason why length of a travelling wave radiation is multiple of half wavelength? [7M]

6. a) With a neat sketch explain the absolute method of measuring the gain of an antenna. [7M]
   b) Explain the significance, merits and demerits of zoning lens antennas. [7M]

7. a) Discuss the importance of ground wave propagation for communication purposes. Why ground waves are not received beyond certain range? [7M]
   b) Establish the effect of D-layer in sky wave propagation. Derive the expression for f_c in Sky wave propagation. [7M]

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