Hall Ticket No | | | | | | | | | | | Question Paper Code:AECC18

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
(Dundigal-500043, Hyderabad)

B.Tech V SEMESTER END EXAMINATIONS (REGULAR) - DECEMBER 2022
Regulation:UG20

ANTENNAS AND WAVE PROPAGATION

Time: 3 Hours (ELECTRONICS AND COMMUNICATION ENGINEERING) **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Discuss in detail about loop antenna and write their advantages, disadvantages and applications. [BL: Understand| CO: 1|Marks: 7]

   (b) Determine the expressions for the power radiated by a half wave dipole antenna and calculate the radiation resistance of the antenna. [BL: Understand| CO: 1|Marks: 7]

MODULE – II

2. (a) What is electromagnetic horn antenna? With neat sketch, explain the operation of helical antenna. [BL: Understand| CO: 2|Marks: 7]

   (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. [BL: Apply| CO: 2|Marks: 7]

MODULE – III

3. (a) Explain the principle of working of lens antenna and show that the contour of a nonmetallic dielectric lens antenna is a hyperbola. [BL: Understand| CO: 3|Marks: 7]

   (b) A parabolic dish antenna provides a gain of 75dB at a frequency of 15GHz. Calculate the capture area, HPBW and FNBW. [BL: Apply| CO: 3|Marks: 7]

4. (a) Describe the geometry of paraboloidal reflector with neat diagram. List the advantages of parabolic reflector antenna. [BL: Understand| CO: 4|Marks: 7]

   (b) Calculate the diameter of the reflector antenna that has a 0.5 deg HPBW at a frequency of 8.2 GHz. Assume an efficiency constant = 0.6. Calculate the antenna gain and effective aperture. [BL: Apply| CO: 4|Marks: 7]

MODULE – IV

5. (a) Demonstrate binomial array antenna. Write basic principle and working of it. Mention its advantages and disadvantages. [BL: Understand| CO: 5|Marks: 7]

   (b) A broadside array operating at 100cm wavelength consists of four half wave dipoles spaced 50 cm. Each element carries radio frequency current in the same phase and magnitude 0.5 Amp. Calculate the radiated power. [BL: Apply| CO: 5|Marks: 7]

6. (a) Outline in brief about sources of errors in antenna measurements and illustrate radiation pattern with neat sketch. [BL: Understand| CO: 5|Marks: 7]

   (b) A BSA of identical antenna consists of 8 isotropic radiators separated by a $\lambda/2$. Find radiation field in a plane containing line of array showing the directions of maxima and minima also find directivity. [BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) List the factors that affect the propagation of radio waves? Demonstrate the field strength of a space wave neglecting the curvature of the earth. [BL: Understand| CO: 6|Marks: 7]

   (b) A high frequency radio link has to be established between two points at a distance of 2500 km on earth's surface. Considering the ionospheric height to be 200km and its critical frequency 5MHz. Calculate the MUF for the given path. [BL: Apply| CO: 6|Marks: 7]

8. (a) Summarize the following in detail

   i) Space wave propagation

   ii) Duct propagation. [BL: Understand| CO: 6|Marks: 7]

   (b) Solve the value of operating frequency of ionosphere layer specified by refractive index of 0.85 and electron density of 5 x 10^5 electrons/m^3. Calculate the critical frequency and MUF with $\phi_i = 30^0$. [BL: Apply| CO: 6|Marks: 7]

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