

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2120

Roll No.

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B.Tech.

(SEM. V) THEORY EXAMINATION 2011-12

ANTENNA AND WAVE PROPAGATION

Time : 2 Hours

Total Marks : 50

- Note :-** (1) All questions carry equal marks.
(2) Attempt all questions.

1. Attempt any four parts of the following : **(2.5×4=10)**
- Explain Antenna Action. Define any of its four parameter.
 - An antenna has an effective height of 10m and the current at the base is 450A (rms) at 50 kHz. Calculate the power radiated. If the total resistance of the antenna system is 1.5Ω , find out the efficiency of the antenna.
 - How retarded potentials are useful in deriving the radiated field due to any Antenna ?
 - Show that the directivity of an alternating current element is 1.76 dB.
 - Find the Gain, beamwidth and capture area for a parabolic antenna with a 6 m diameter dish and dipole fixed at a frequency of 10 GHz.

- (f) Find out the Radiation Resistance of a $\lambda/8$ wire dipole in free space.

2. Attempt any **four** parts of the following : (2.5×4=10)

- (a) Classify various types of Antenna array with example.
- (b) Derive and draw the radiation pattern of two isotropic sources separated by a distance $\lambda/4$ with an initial phase of 90° .
- (c) With the help of pattern multiplication draw the radiation pattern of 4 element isotropic array separated by $\lambda/2$ with the initial phase of 0° among them.
- (d) Design Yagi-Uda antenna of 6 elements to provide a gain of 10 dBi if the operating frequency is 200 MHz.
- (e) Derive the radiation resistance of a $\lambda/2$ antenna.
- (f) Derive the field component of short electric dipole.

3. Attempt any **two** parts of the following : (5×2=10)

- (a) Design a helical antenna operating in the axial mode that gives a directivity of 14 dB at 2.4 GHz. For this helical antenna, calculate the input impedance, half power beamwidth, beamwidth between the nulls, and the axial ratio.
- (b) Determine the directivity of a loop antenna whose radius is 0.5m, when it is operated at 0.9 MHz. Explain two of its applications.

- (c) Design a log periodic dipole array having a $\tau = 0.895$ and $\sigma = 0.166$ over a frequency range of 10 MHz to 30 MHz.
4. Attempt any **two** parts of the following : **(5×2=10)**
- (a) Discuss various types of reflectors used to modify the radiation pattern of any Antenna. Explain paraboloid Reflector and derive HPBW for large circular aperture.
- (b) Explain the working of Pyramidal Horn Antenna.
- (c) Explain Absolute Gain Measurement technique of Antenna. In three antenna method of Gain Measurement, the measured receive powers taking two antennas at a time are 0.0297 mW, 0.0471 mW, and 0.0374 mW. Calculate the gains of the antennas, if the transmit power is 1 W, spacing between the antennas is 10 m and the frequency of operation is 980 MHz.
5. Attempt any **two** parts of the following : **(5×2=10)**
- (a) Why we use the term modified refractive index in propagation of radio waves. In which type of propagation it is valid and what is its value ?
- (b) Explain the structure of Ionosphere. Explain any two parameters of sky wave propagation.
- (c) What is troposphere ? Explain the mechanism of wave propagation in this region.