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TEC-505

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

PAPER ID : 3089

Roll No.

**B. Tech.**

(SEM. V) EXAMINATION, 2008-09

**ANTENNA & WAVE PROPAGATION**

Time : 3 Hours]

[Total Marks : 100

Note : Answers all questions.

1 Answer any two questions of the following : 2×10=20

(a) What is a half-wave dipole ? Assuming a sinusoidal current distribution over the dipole length derive an expression for the vector potential. A at a large distance from the dipole. Clearly mention the approximations made in the derivation.

(b) Explain the following :  
(i) Gain of an antenna  
(ii) Directivity  
(iii) Radiation resistance  
(iv) Radiation Intensity  
(v) Effective area.

(c) Write short notes on :  
(i) Hertzian dipole  
(ii) Short electric dipole  
(iii) HPBW and BWFN  
(iv) Reciprocity theorem.





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2 Answer any **two** of the following :  $2 \times 10 = 20$

- (a) What is a broadside array ? Deduce an expression for the radiation pattern of a broadside array with  $n$  vertical dipoles. Plot the radiation pattern in (i) vertical and (ii) horizontal planes for such an array with four dipoles.
- (b) Explain the principle of operation of a linear array antenna. What are its advantages ? Two isotropic radiators, spaced at a distance  $\lambda/4$  apart, carry equal currents which are  $90^\circ$  out of phase. Find the value of the electric field strength in a direction making an angle of  $45^\circ$  with the line joining the elements in terms of maximum field strength produced.
- (c) Write short note on Binomial array. What is pattern multiplication ? Explain its importance by relevant examples.

3 Answer any **two** of the following :  $2 \times 10 = 20$

- (a) Explain how long, medium and short waves are propagated over short and long distances and comment on their applications in the field of practical radio-communication. What are the causes of fading of short waves ? How can fading be minimized ?
- (b) Describe the structure of the ionosphere. Discuss briefly the part played by the ionosphere in radio-wave propagation.
- (c) Using the properties of ionosphere show that electromagnetic waves of frequency greater than a certain critical frequency are not reflected by the ionosphere.  
Derive the relation of maximum range covered by the spacewave when earth is considered curve.



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4 Answer any **two** of the following :  $10 \times 2 = 20$

- (a) Describe the principle of direction finding by means of a closed loop frame antenna and give the expression for the induced voltage and field strength for short loop and large loop. Draw its radiation pattern also.
- (b) Describe a horn antenna. How is this antenna fed and what are its applications ? A pyramidal horn antenna has an aperture of  $20 \text{ cm} \times 15 \text{ cm}$ . Assuming the field distribution to be uniform over the aperture. (phase = constant all over the aperture), estimate the maximum directivity and the beamwidth of the antenna.
- (c) Design log-periodic antenna.

5 Write short notes on any **four** :  $4 \times 5 = 20$

- (a) Radiation pattern measurement
- (b) Gain measurement
- (c) Antenna efficiency measurement
- (d) Polarization measurement
- (e) Noise measurement.

