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7E4044

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B. Tech. (Sem. VII) (Main/Back) Examination, December-2012
Electronics & Comm.
7EC1 Antenna & Wave Propogation
(Common for 7AI 6.1 and 7IC1)

Time : 3 Hours] [Maximum Marks : 80
[Min. Passing Marks : 24

Attempt any five questions. Selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. Nil 2. Nil

UNIT - I

1 (a) The field pattern for an antenna is

$E(\theta) = \cos^2\theta$ for $0^\circ \le \theta \le 90^\circ$

Calculate the θ_{HP} and ϕ_{HP} for it.
Also calculate the beam area for it.

4+4+2=10

(b) Write the units of :
(i) Beam area
(ii) Radiation resistance
(iii) Radiation intensity
(iv) Directivity
(v) Beam width and
(vi) Beam efficiency.

1×6=6

OR

1 (a) Find the relation between antenna gain and directivity. If the normalized field pattern is given by

$$E_n = \sin\left(\frac{\pi}{2n}\right)\frac{\sin\left(\frac{n\psi}{2}\right)}{\sin\psi/2}$$

Where $\psi = dr(\cos\phi - 1) - \frac{\pi}{n}$

$d_r = \pi/q, n = 10.$

Calculate its gain.

4+6=10

(b) Define the following :

(i) Antenna bandwidth

(ii) Antenna cross-section

(iii) Antenna polarization.

3×2=6

UNIT - II

2 (a) Draw the radiation pattern for :

(i) Log periodic antenna with reflector ground plane.

(ii) Rhombic antenna

(iii) Crossed dipole antenna as shown below.

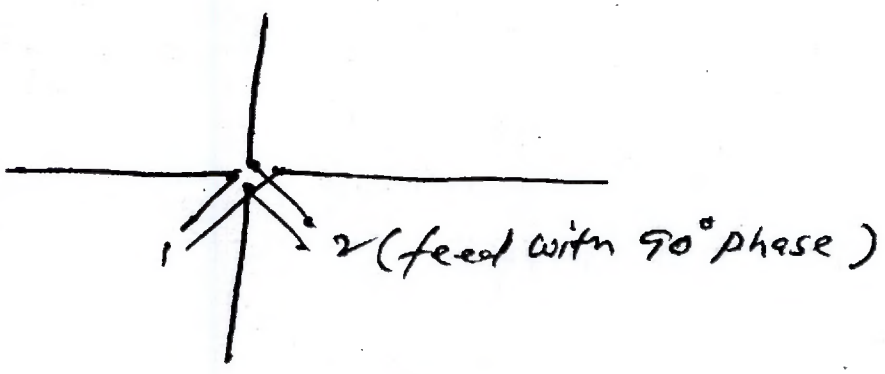

Fig.

(iv) Microstrip patch antenna.

4×2=8

(b) Prove that for a helical antenna

$$C_\lambda = \sqrt{2s_\lambda + 1} \text{ and } \frac{L_\lambda}{P} = S_\lambda + m$$

Where P is phase velocity and other symbols has the usual meaning for helical antenna.

Also discuss the case for

(i) P = 1, M = 0 and M = 1.

3+3+2=8

OR

2 (a) Prove that the field for a loop antenna is

$$\varepsilon_\phi = \frac{120\pi^2 [I] \sin\theta}{r} \frac{A}{\lambda^2}$$

Also draw its radiation pattern.

8

(b) Write the difference between :

(i) Resonant and non-resonant antenna

(ii) Square and circular loop antenna

(iii) Spiral and Helical antenna

(iv) Wide band and Narrow band antennas.

4×2=8

UNIT - III

3 (a) Explain the principle for achieve the radiation pattern without side lobe in an antenna array 3. Using it find the relative anplitude distribution for an 6 element array.

4+4=8

(b) Prove that the normalized field for a N-element array is given by

$$E_n = \frac{\sin\left(N\frac{\Psi}{2}\right)}{\sin\frac{\Psi}{2}}$$

Find the general expression for its HPBW and FNBW.

4+2×2=8

OR

3 (a) Draw the radiation pattern for a binomial array that consists and elements. Also calculate its resultant gain and FNBW.

4+2×3=10

(b) Write the conditions for :

(i) Linear array

(ii) END - fire array and

(iii) Broad band array.

3×2=6

UNIT - IV

4 (a) Explain the reflection from inosphere layer and compare it optical fibre. Find the expression for critical frequency for a given layer.

2+6=8

(b) What is "shadow zone" find the expression for "Maximum aseable frequency" for a given layer.

2+6=8

OR

4 (a) Explain the different mode of wave propagation and compare these for their frequency range, distance of propagation and applications.

4+6=10

(b) Explain the role of :
(i) Temperature variation and
(ii) Environment conditions on wave propagation.

2×3=6

UNIT - V

5 (a) Explain the role of multiple hop transmission for increase the distance of propagations. Also discuss the reason for multiple hop transmission.

4+4=8

(b) What is "Virtual height" ? Find the expression for maximum distance of propagation for a given height of transmitting and receiving antenna.

4+4=8

OR

5 Explain the effects of :
(i) Eirth's magnetic field
(ii) Solar activity
(iii) Oblique incidence and
(iv) Presence of reflecting bodies on wave propagation.

4×4=16
