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RN-6791

B. E. - III (Sem. V) (ECC) Examination

May / June – 2010

Antenna & Wave Propagation

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 3 (Sem. 5) (ECC)**

Name of the Subject :

☛ **Antenna & Wave Propagation**

☛Subject Code No. : **6 7 9 1** ☛Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answers to the two sections must be written in separately.
(3) Assume suitable data wherever necessary.
(4) Figures to the right indicate **full** marks.
(5) Attempt all questions.
(6) Draw the figures wherever needed.
(7) Use of scientific calculator CASIO fx-82/83, Fx100 or equivalent of other companies is allowed.
(8) Acronyms carry their usual meaning.

Section-1

1 (a) Define the following : **10**
(1) Radiation Resistance
(2) Directive Gain
(3) Effective aperture
(4) Broadside array
(5) End-fire array

(b) Assuming sinusoidal current distribution, on Half wave dipole, show that its radiation resistance is only 73Ω. **10**

2 (a) Stating all assumptions clearly, with the help of vector magnetic potential derive expression for electic and magnetic field due to small alternation current element **8**

(b) Find the Null ToNull beam width of end fire aaray.
(a) when array length l =10λ and N=20
(b) l=50λ and N=100
(3) l=10λ and N=50 **7**

OR

2 (a) Explain the following approaches to determine suitable potentials for electromagnetic field
(i) Heuristic Approach (ii)maxwell's equation Approach **8**

(b) Prove that impedance of an antenna in transmitting and receiving mode are equal. **7**

3 **Attempt any three.** 15

(1) Explain the concept of multiplication of Patterns with the example of 4-element uniform array.

(2) Whatis transmission loss between antennas ? Derive the equation for basic transmission loss.

(3) Binomial Array

(4) Antenna Synthesis

(5) Balun

SECTION-II

Q-4(a). Do as directed

1. Connect appropriate characteristic of B with antenna of A (5)

A	B
(a) Log periodic	(i) Circular polarization
(b) Dielectric lens	(ii) Linear polarization
(c) Turnstile antenna	(iii) Passive antenna
(d) Helical antenna	(iv) TV transmitting antenna
(e) Slot antenna	(v) Broadband antenna

2. Why zoning can be made on ordinary dielectric lense antenna. State the disadvantage of zoning. (2)
3. Find HPBW and Directivity of 16-turn helical antenna has a circumference of λ and turn spacing of $\lambda/4$. (2)
4. Write Rumsey's principle (1)

Q.4(b)

(i) For a given field of loop antenna, derive the radiation resistance of same. (6)

(ii) Draw helical geometry. State the physical significance of pitch angle. (4)

Q-5(a) Explain artificial lens antenna and derive the refractive index of artificial dielectric conducting sphere. (8)

(b) Explain the following terms related to ionosphere propagation (7)

1. Critical frequency
2. Virtual height
3. Maximum usable frequency
4. Skip distance

OR

Q-5(a) Show that for a folded $\lambda/2$ dipole having N wires, the terminal reactance is $70N^2$ (7)

(b) Explain the mechanism of reflection and refraction of radio waves by the ionosphere at high frequencies and finally prove $f_{cr} = \sqrt{81 N_{max}}$ where f_{cr} is the critical frequency of the layer and N_{max} is the maximum ionization density of the layer in electrons/cm^3 (8)

Q-6 Write a short notes (Attempt any three) (15)

(a) Microstrip antenna

(b) Paraboloidal reflector

(c) Turnstile antenna

(d) Planner log-spiral antenna

(e) Polyrod antenna