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SE-6791

B. E. III (Sem. V) (EC/ECC) Examination

April / May – 2011

EC-506 Antenna and 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) (EC/ECC)

Name of the Subject :

☛ EC-506 Antenna and Wave Propagation

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

Seat No. :

Student's Signature

(2) Attempt all the questions.
(3) Figures to right indicate full marks.
(4) Assume suitable data whenever necessary.

SECTION - I

1 (a) Answer the following in brief. **15**

(1) State the source of radiation and briefly explain radiation mechanism.

(2) Differentiate the Beam width and Bandwidth of an antenna.

(3) What is polarization ? Explain its various types in brief.

(4) An antenna having a radiation resistance of 95 Ω is radiating 8 kW. How much current flows into the antenna ?

(5) Establish the relation between directivity and effective area.

(b) Two space crafts separated by 3000 km. Each has antenna with g_{dmax}=200 and operating at 2 GHz. If receiver an space craft A requires 20 dB power 1 pW, what transmitter power is required on space craft B to achieve this signal level ? **5**

2 (a) What is broadside array ? Derive expression for the radiation pattern of a broadside array of n element. 8

(b) What is linear array ? Derive the equation for the normalised value of electric filed intensity of linear array. 7

OR

(a) What is end fire array ? Derive expression for the radiation pattern of an end fire array of n element. 8

(b) What is the main application of loop antenna ? Derive the expression for electric field at a large distance from small square loop with uniform in phase current. 7

3 Attempt any three 15

(a) Write short note on Binomial array.

(b) With help of pattern multiplication principle find the resultant pattern of eight isotropic sources with spacing $\lambda/2$ and out of phase.

(c) Design five element broad side optimum array of isotropic sources of $\lambda/2$ spacing between the elements. The pattern is to be optimum with a side lobe-20 dB to the main lobe maximum.

(d) An antenna has an effective length of 25 meters and the current at the base is 150 amperes rms at 50 kHz. What is the power radiated ? If the total resistance of the antenna circuits is 1.5 ohms, what is the efficiency of the antenna ?

(E) What is an effective aperture ? Derive the equation of effective aperture and prove that maximum effective aperture is equal to scattering aperture.

SECTION - II

4 (a) Answer the following briefly : 10

(1) State Rumsey's principle for frequency independent antenna.

(2) State and explain Rayleigh criterion with reference to earth reflection.

(3) State the different elements of a seven segment parasitic array of Yagi uda antenna used for TV reception.

(4) State the applications of helical antenna.

(5) A right handed circular monofilar helical antenna has 10 turns. 100 mm diameter and 70 mm turn spacing. The frequency is 1 GHz. Calculate Directivity.

(b) Calculate the radiation resistance of a single turn and eight (8) turn small circular loop when the radius of the loop is $\lambda/25$ and medium is free. Also find directivity for single turn loop antenna. **6**

5 (a) Explain LPDA with neat diagram. 8

(b) Explain Babinet's principle and apply it to a slot antenna. 8

OR

(a) (1) Explain different types of regular and irregular variations in ionosphere. **6**

(2) Categorize waves according to their propagation paths. **2**

(b) What is microstrip antenna ? Where it can be used ? Explain the feeding technique for the same. 8

6 Write short notes : (any **three**) **18**

(1) Paraboloidal reflector

(2) Turnstile antenna

(3) Critical frequency, effective height and MUF.

(4) H plane metal plate lens antenna

(5) Horn antenna.
