Registration no: | | | | | | | | | | |

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B.Tech
PEEC5304

6th Semester Regular / Back Examination 2016-17
ANTENNAS AND WAVE PROPAGATION
BRANCH: ECE, ETC
Time: 3 Hours
Max Marks: 70
Q.CODE: Z678

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions:** **(2 x 10)**

a) Write down beam width of major lobe of end-fire array.

b) The maximum effective area is given by $A_{em} = 0.15\lambda^2$ Then calculate the effective height of a half wave dipole antenna operating at $\lambda = 1.55m$.

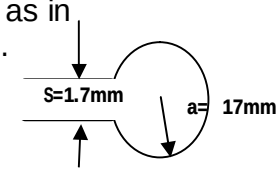
c) What is the relation between equivalent temperature and brightness temperature of antenna? Write down relation between emissivity and reflection coefficient of surface wave.

d) In lossless case what is the relation between noise powers at receiver with band width of antenna.

e) Calculate input resistance of $\frac{\lambda}{4.2}$ length of dipole antenna resonating at 3GHz.

f) What is the value of max effective area of 0.5λ dipole antenna resonating at 10GHz.

g) Assume infinitesimal small radius of wire make a loop antenna as in side figure. Calculate average impedance of loop wire antenna.



h) Draw the diagram of pyramidal, sectorial E-plane, sectorial H-plane and exponential tapered pyramidal rectangular horn antenna.

i) A uniform array consists of 18 isotropic point source, each separated at distance $\frac{\lambda}{4}$. If phase difference $\delta = -90^0$ .Calculate HPBW.

j) In tropospheric space wave communication system the height of antenna are defined as 4λ and 4.1λ. The direct path distance is given by 10km and operating wave length is 10m. Calculate loss coefficient.

Q2 **a)** What is plane wave? Write its properties. **(2)**

b) Find the solution of Helmholtz's wave equation for charge free region. Explain importance of loss tangent of the medium during wave propagation. **(8)**

Q3 **a)** Find Thevenin's equivalent circuit of $T_x$antenna. **(5)**

b) Find Norton's equivalent circuit of R_x antenna. **(5)**

Q4 For mobile communication over a height of 120km via ionosphere layer with $N_{max} = 2.22X10^5\ electron/m^3$. MUF is given 6.5KHz, then find **(10)**

(i) Optimum working frequency (f_c)

(ii) Critical frequency

(iii) Elevation angle of beam

(iv) Skip distance

Q5 **a)** Write down the principle of pattern multiplication **(4)**

b) Write down Tchefyscheff Plynomial $T_x(m)$ for $|x| < \pm 1$ and $|x| > \pm 1$. And then for $|x| < \pm 1$ expand T for all m=0,1,2,3. **(6)**

Q6 **a)** Write the basic configuration of loop antenna and basic geometries of loop antenna **(5)**

b) Write the principle of operation of loop antenna. **(5)**

Q7 Derive E and H field for Hertzian Dipole Antenna. Find the average radiated power. **(10)**

Q8 **Write short answer on any TWO:** **(5 x 2)**

a) Impedance BW and Quality factor.

b) Directivity in-terms of radiation intensity and narrow major lobes with negligible minor lobe

c) Rectangular patch antenna

d) Duct gradient and M-Curve