Sixth Semester B.E. Degree Examination, Jan./Feb.2021
Antennas and Propagation

Time: 3 hrs.

Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Define Antenna beam width. Explain the method of beam width measurement with neat sketch. **(07 Marks)**
   b. Show that the maximum effective aperture of a short dipole is $0.119 \lambda^2$. **(07 Marks)**
   c. Consider two similar dipole having length of 3 cm used as transmitting and receiving antennas. Find the power received by the receiving antennas if it is placed at a distance of 10 m from the transmitting antenna which is radiating 15 W average power at f = 1 GHz. **(06 Marks)**

2 a. Derive Maxima, Minima and half power point directions if two point sources are fed with currents equal in magnitude but opposite in phase. **(08 Marks)**
   b. Explain in detail pattern multiplication method. **(05 Marks)**
   c. Sketch the radiation pattern of a two element array having identical radiators spaced $\lambda/4$ apart and current in one radiator lags behind other by 90°. **(07 Marks)**

3 a. Derive an expression for radiation resistance for $\dfrac{\lambda}{2}$-Dipole. **(07 Marks)**
   b. Explain basic concept of folded dipole antenna and compare it with single half wave dipole. Write applications of folded dipole antenna. **(06 Marks)**
   c. Determine magnitude of $\overline{E} \,\&\, \overline{H}$ of a half wave dipole operated at frequency of 300 MHz at a distance of 100 m in the broad side plane for maximum radiation. I/P current to antenna is $100\angle 0°$ mA. How much average power radiated by antenna. **(07 Marks)**

4 a. Derive expression for field components for general loop antenna. **(07 Marks)**
   b. Explain babinets principle for electromagnetic fields. **(06 Marks)**
   c. Determine length ρ of the horn, H-plane aperature and flare angles θ_E and θ_H in (E and H plane respectively) of a pyramidal horn for which E-plane aperature is 10 λ. The horn is fed with a rectangular waveguide with T_{E10} mode. Let $\delta = 0.2$ λ in E-plane and 0.375 λ in H plane. Calculate Bandwidth and directivity. **(07 Marks)**

PART – B

5 a. Explain with suitable sketches perpendicular or radiation in helical antenna. **(06 Marks)**
   b. With neat sketch and explain various types of Horn Antennas.. **(06 Marks)**
   c. Write short notes on:
      (i)   Principle of parabolic reflector antenna.
      (ii) Log periodic antenna. **(08 Marks)**

6 a. Explain how GPR system differs from general radar system. What are different considerations for antennas used in GPR system? **(05 Marks)**
   b. Write short notes on :
      (i)   Plasma Antenna
      (ii)   Embedded Antennas.
      (iii) Superturnstile Antenna. **(15 Marks)**

7   a. Derive an expression for field strength of receiver at space wave propagation.   (08 Marks)
    b. Derive an expression for radius of curvature of earth and change in refractive Index with height.   (07 Marks)
    c. Write notes on tropospheric scattering.   (05 Marks)

8   a. Derive an expression for f_{MUF} for the flat earth.   (06 Marks)
    b. Assume that the reflection takes place at a height of 400 km and that the maximum density in the ionosphere corresponds to the 0.9 refractive index at 10 MHz. What will be the skip distance for flat earth for which f_{MUF} is 10 MHz?   (06 Marks)
    c. Define the following : (i) Maximum usable frequency
                               (ii) Skip distance.   (08 Marks)

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