USN

Sixth Semester B.E. Degree Examination, June/July 2019
Antennas and Propagation

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting*
at least TWO full questions from each part.
2. Assume any missing data suitably.
3. Draw neat diagrams wherever necessary.

PART – A

1   a. Explain the following Antenna parameters:
    i)   Beam solid angle
    ii)   Radiation intensity
    iii)   Beam efficiency
    iv)   Directivity
    v)   Gain   **(10 Marks)**
    b. Find the relation between effective aperture and directivity.   **(05 Marks)**
    c. Derive Friis transmission formula.   **(05 Marks)**

2   a. For a source having radiation intensity u-$u_m \sin\theta\sin^2\phi$ find the directivity by
    i) Exact method   ii) Approximate method.   **(08 Marks)**
    b. Calculate the maximum power received at a distance of 0.5km over a free space 1GHz
        circuit consisting of transmitting antenna with 25dh gain and a receiving antenna gain of
        20db. Assume the transmitting antenna input is 150 watts.   **(06 Marks)**
    c. State and explain power theorem.   **(06 Marks)**

3   a. Derive an expression for field intensity for two isotropic point sources with equal amplitude
        and equal phase.   **(10 Marks)**
    b. Illustrate the principle of pattern multiplication with suitable examples. **(05 Marks)**
    c. Calculate and plot the field pattern of an array of two non isotropic dissimilar sources for

        which the total field is given by $E = \cos\phi + \sin\phi \lfloor\psi$ where $\psi = \dfrac{\pi}{2}(\cos\phi + 1)$. Take source

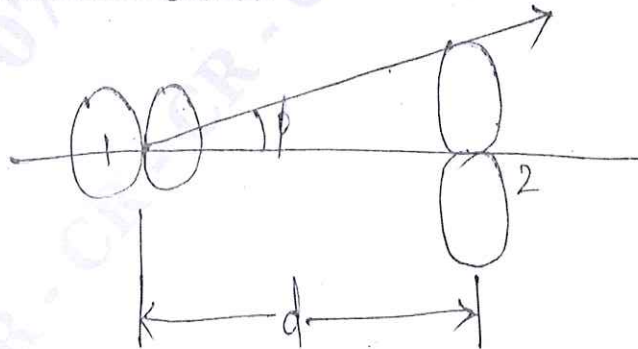   1 as the reference as shown in Fig.Q.3(c).   **(05 Marks)**

Fig.Q.3(c)

4 a. Derive an expression for radiation resistance of a short electric dipole. (10 Marks)
  b. Write short notes on:
     i) Folded dipole antenna
     ii) Thin linear antenna. (10 Marks)

PART – B

5 a. Show that the radiation resistance of loop antenna is given by $31200\left(\dfrac{n\Lambda}{\lambda^2}\right)^2$. (10 Marks)

  b. Write notes on: i) Patch antenna   ii) Slot antenna. (10 Marks)

6   Write short notes on:
  a. Antennas for ground penetrating radar (05 Marks)
  b. Embedded antenna (05 Marks)
  c. Turnstile antenna (05 Marks)
  d. Log periodic antenna. (05 Marks)

7 a. Explain the propagation of wave by means of i) Surface wave   ii) Diffraction. (10 Marks)
  b. For isotropic wave propagation, show that the radius of curvature of path is a function of rate of change of refractive index with height and explain the duct wave of propagation. (10 Marks)

8 a. Explain different layers of ionosphere in detail. (10 Marks)
  b. Define the following with respect to wave propagation:
     i) Critical frequency
     ii) Maximum usable frequency
     iii) Virtual height
     iv) Skip distance. (10 Marks)

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