Roll No:

B. TECH.
(SEM V) THEORY EXAMINATION 2021-22
ANTENNA AND WAVE PROPAGATION

Time: 3 Hours   *Total Marks: 70*

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt *all* questions in brief.**   **2 x 7 = 14**
   a.   Define the term antenna resolution. Also relate it with directivity.
   b.   Evaluate the directivity of a given linear broadside, uniform array of 10 elements with a separation of $\lambda/4$ between the elements.
   c.   Define short electric dipole.
   d.   Explain gain and beam efficiency of an antenna.
   e.   Differentiate between radiation density and radiation intensity.
   f.   Determine the relation between radian and steradian.
   g.   Discuss the different types of long wire antenna.

SECTION B

2. **Attempt any *three* of the following:**   **7 x 3 = 21**
   a.   Determine the expression of direction of pattern maxima, direction of side lobe maxima, null direction, SLL(side lobe level) and HPBW for an uniform array of N isotropic point sources.
   b.   Discuss Friss transmission formula mathematically.
   c.   Explain the optical equivalent of Yagi Uda antenna with its construction, properties and applications.
   d.   Illustrate slot antenna with its features and feed types.
   e.   Describe the modes of radio wave propagation.

SECTION C

3. **Attempt any *one* part of the following:**   **7 x 1 = 7**
   (a)   Define directivity of an antenna and find the relationship between directivity and gain of antenna.
   (b)   Examine the phenomenon of fields originating from an oscillating dipole along with proper diagram.
4. **Attempt any *one* part of the following:**   **7 x 1 = 7**
   (a)   Discuss linear broadside arrays with non-uniform amplitude distribution.
   (b)   For broad side array consisting of 16 isotropic point sources with a spacing $\lambda/4$ between them. Calculate HPBW and Beam solid angle.
5. **Attempt any *one* part of the following:**   **7 x 1 = 7**
   (a)   Show how the transmitted power is related to the received power by Friiss transmission formula.
   (b)   Describe the method of measurement of radiation pattern and show the different types of radiation patterns .
6. **Attempt any *one* part of the following:**   **7 x 1 = 7**
   (a)   Explain the structure, characteristics and applications of micro strip antenna.
   (b)   Describe Log periodic antenna with suitable design equations and working.
7. **Attempt any *one* part of the following:**   **7 x 1 = 7**
   (a)   Derive the relation between virtual height and skip distance considering the earth to be straight.
   (b)   Calculate the expression for refractive index of ionosphere.