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Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, April 2014
(2008 Scheme)
08.605 : ANTENNA AND WAVE PROPAGATION (T)

Time: 3 Hours Max. Marks: 100

PART – A

(Answer **all** questions)

1. Explain duality theorem.

2. a) If Ex = 3 cos ω t and Ey = 3sin ω t are the components of a wave travelling in the negative z direction, then what will be the type of antenna used for intercepting this wave (as per IEEE convention). 2

   b) Show that a linearly polarized wave is a combination of 2 circular polarized waves. 2

3. The radiation intensity of main to be of an antenna is u = Bcos θ where B is the maximum radiation intensity existing in the upper hemesphere ($0 \leq \theta \leq \pi/2$) and ($0 \leq \phi \leq 2\pi$). Find directivity by using beam solid angle expression and by exact value.

4. Using pattern multiplication, find the resultant pattern of 2 element array of infinitesimal horizontal dipoles of spacing $\lambda/4$ and $\beta = -90°$.

5. Explain resonant and non resonant antennas. Also give their applications.

6. What are the gains associated with an antenna ?

7. Derive the relationship between M.U.F. and critical frequency.

P.T.O.

8. Calculate the transmission path distance for an ionospheric transmission that utilize a layer of height 200 km. Angle of elevation of antenna beam is 20°. The earths radius is 6370 km (Assume flat earth).

9. A high frequency radio link has to be established between 2 points on the earth 200 km away. The reflection of the ionosphere is at a height of 200 km and has a critical frequency of 6 MHz. Calculate the MUF for the given path.

10. a) What is the critical frequency for reflection at vertical incidence if the maximum value of electron density is 1.24×10^6 cm^{-3} ? 2

    b) A television transmitter antenna has a height of 179 m and receiving antenna height is 19 m. What is the maximum distance through which TV signal could be received by space propagation ?

(10×4=40 Marks)

PART – B

Answer **two** questions from **each** Module. **Each** question carries **10** marks.

Module – I

11. a) Illustrate with sketches at different time instants how a dipole radiates in free space. 6

    b) Derive the relationship between effective length and effective area. 4

12. Derive expression for directivity and radiation resistance for a half wave dipole working out from infinitesimal dipole field expression.

13. a) Explain how radiation pattern measurement is carried out practically. 8

    b) Find the radiation resistance of a dipole of length $\lambda / 60$. 2

Module – II

14. Write note on helical antenna working in

    a) Normal mode

    b) Axial mode.

15. Using the graph given below :

Design a uniform scanning array whose maximum of the array factor is 45° from the axis of array.

The desired HPBW (half power beam width) is 1.5°.

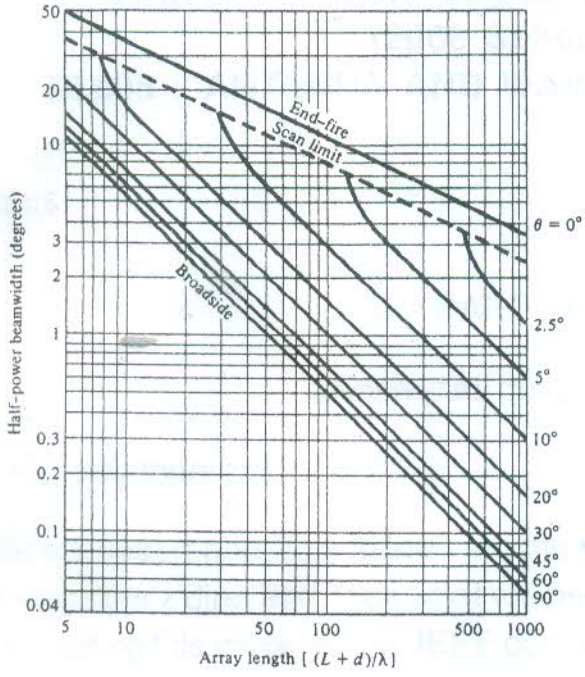

Fig. Half power beam width and array length for broadside end fire and scanning uniform linear arrays.

While spacing between the elements is $\lambda/4$. Determine the excitation of elements (amplitude and phase) length of array in wavelengths (λ) and number of elements.

16. a) Write note on rectangular patch antenna with diagram indicating field distributions. 7

b) What are the various feeding techniques used for exciting patch antennas ? 3

Module – III

17. a) Explain duct propagation. 6

b) Explain tropospheric scatter propagation. 4

18. a) Derive the expression for refractive index of ionosphere neglecting earth's magnetic field on ionosphere. 7

b) What do you mean by magneto ionic splitting ? 3

19. Explain ELF propagation in sea water.