Code No: 07A5EC08 **R07** **Set No. 2**

III B.Tech I Semester Examinations,May 2011
ANTENNAS AND WAVE PROPAGATION
Common to Electronics And Telematics, Electronics And Communication Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is the highest frequency that will be returned to earth 1000km from the transmitter by the E layer?
   (b) Describe how the ionospheric layers D, E, F1 and F2 are formed? [8+8]
2. The antenna of a TV transmitter is located at aheight of 500ftcalculate and plot as function of distance to the transmitter , the height that the receiving antenna must have in order to be above the radio horizon? [16]
3. (a) What is retarded potentials? Explain the significance of it.
   (b) Calculate the radiation resistance of an antenna which is drawing 15A current and radiating 6kW. [10+6]
4. (a) List advantages and disadvantages of rhombic antenna.
   (b) Explain structure of helix in helical antenna using neat sketch. [8+8]
5. Discuss different feed methods of paraboloidal reflectors in terms of F/D ratio, Spill over, back lobes ? [16]
6. (a) Explain how antenna aperture efficiency measurement is carried out?
   (b) What is the approximate maximum power gain of an optimum horn antenna with a square aperture 9λ on a side? [8+8]
7. (a) An array antenna consists of two elements with uniform in-phase excitation and an element spacing of 2 λ. Determine the number and the directions of maxima and nulls in the array factor
   (b) What is the maximum element spacing allowed in a binomial array so that no part of the grating lobe appears in the visible region if it is a broadside array with α=0 ? [8+8]
8. (a) Why an Isotropic Radiator is called Omnidirectional radiator?
   (b) Show that the total radiated power of a Hertzian dipole of length dl excited by a current I_0 is given by $P_{rad} = \eta\frac{\pi}{3}\left(I_0\frac{dl}{\lambda}\right)^2$If the dipole is oriented along the z direction, show that the directivity is given by $D(\theta, \phi) = 1.5\sin^2\theta$. [6+10]

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Code No: 07A5EC08 **R07** **Set No. 4**

III B.Tech I Semester Examinations,May 2011
ANTENNAS AND WAVE PROPAGATION
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Draw the radiation pattern of an dipole Antenna and explain all its characteristics?
   (b) What is the maximum effective aperture area for a beam antenna having half-power widths of 30^0 and 25^0 in perpendicular planes intersecting in the beam axis? Assume that minor lobes are small and can be neglected. [8+8]

2. (a) Explain the characteristics and properties of a Broad side array.
   (b) An array consists of four identical isotropic sources located at corners of a square having diagonal length $3\lambda/4$ and excited with equal current in same phase. Determine the polar diagram of the array in the plane containing the sources. [8+8]

3. (a) How does a parasitic element act when its length is greater than and smaller than λ.
   (b) Explain the geometry of paraboloidal reflectors? [8+8]

4. (a) Describe a method of estimating the height of ionospheric layer?
   (b) Write a short notes on sun spot cycle? [8+8]

5. Explain the effect of the following on tropospheric wave propagation?
   (a) radius of curvature of path
   (b) Earths radius
   (c) Earths curvature. [16]

6. (a) Draw the general structure and radiation pattern of travelling wave antenna and give expression for its electric field strength.
   (b) Explain how unidirectional pattern is obtained using a properly terminated rhombic antenna? [8+8]

7. (a) What is an elementary doublet? How does it differ from the infinitesimal dipole?
   (b) 10m high monopole is to be used as a portable transmitting antenna at 1.5MHz. Its measured base reactance is j350 ohms with Q=100 and ohmic losses in the ground system and turning cost are equal. Find antenna efficiency, gain of the antenna and its aperture.

   [8+8]

8. (a) Which primary feed used for the lens antenna?Why?

   (b) While measuring gain of a horn antenna ,the oscillator was set at 9GHz frequency and the attenuation inserted was 9.8dB.Calculate the gain of the horn antenna if the distance between the two horns is 35cm? [8+8]

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Code No: 07A5EC08 **R07** **Set No. 1**

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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) Compare the performances of different reflectors?
   (b) Discuss the conditions under which parasitic dipole placed near and parallel to a driven dipole can act as reflector? [8+8]

2. (a) Compare resonant antenna with non-resonant antenna?
   (b) Draw the structure of V antenna and determine its radiation pattern. [8+8]

3. Determine the Electromagnetic field radiated in the space by an alternating current element starting from Maxwells Equations and explain the significance of each field components . [16]

4. (a) Why practically Isotropic radiator can not exist?
   (b) A Hertzian dipole of length dl=0.5m is radiating into free space. If the dipole current is 4A and the frequency is 10MHz, calculate the highest power density at a distance of 2km from the antenna.
   (c) What is meant by antenna coupling. Derive condition for same. [4+6+4]

5. (a) Two points on the earth are 1600Km apart and are communicated by means of HF communication .For single hop transmission ,the critical frequency at that time is 7.3MHz.calculate MUF for these two points if the height of the ionospheric layer is 300Km?
   (b) Write short notes on farady rotation? [8+8]

6. (a) Find the field pattern of loop antenna using principle of arrays.
   (b) Show that the peaks of the array factor of an N-element uniform array are given by the solution of the equation$N \tan\left(\frac{}{2}\right) = \tan\left(\frac{N\psi}{2}\right)$. [8+8]

7. A communication link is to be established between the two stations using half wave lenght antenna for maximum directive gain .Transmitter power is 1KW,frequency of operation is 100MHz. and distance between transmitter and receiver is 100Km.what is the maximum power received by the receiver.Explain and derive the formulas used? [16]

8. (a) The pyramidal horn is required to have a half power width of 10^0 in both the vertical and horizontal planes. Determine the dimensions of the horn mouth and the length of the horn in wavelengths, and the directive gain? [16]
   (b) With neat sketch explain the operation of H-plane horn antenna? [8+8]

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Code No: 07A5EC08 **R07** **Set No. 3**

III B.Tech I Semester Examinations,May 2011
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the effect of atmosphere on space wave propagation? [16]
   (b) calculate the maximum wqvelength at which propagation is possible by means of a grounded based duct of 100ft high whenΔM=25. [8+8]
2. Write about the following :
   (a) ionospheric abnormalities.
   (b) formation of ionospheric layers. [8+8]
3. (a) Explain travelling wave antenna and draw its radiation pattern.
   (b) Draw the structure and Explain the principle of working of helical antenna in normal mode. [8+8]
4. Establish the field expressions for a small loop antenna, listing out the assumptions involved, and sketch its pattern? [16]
5. (a) Derive the expressions for Retarded Current using Heuristic Approach.
   (b) Determine magnitude of E and H of a half wave dipole operated at a frequency of 300 MHz at a distance of 100m in the broad side plane for maximum radiation. Input current to antenna is 100mA. How much average power is radiated by this antenna.
   [8+8]
6. (a) A uniform linear array consists 16 isotropic point sources with a spacing of $\lambda/4$. If the phase difference is 90^0, calculate
      i. HPBW,
      ii. Directivity
      iii. Beam Solid Angle
      iv. Effective Aperture.
   (b) Derive the condition for directivity of end fire array with increased directivity .
   [8+8]
7. (a) Determine the length L,aperture a_H and half angles in E and H planes for a pyramidal electromagnetic horn for which the aperture a_E=8 λ.The horn is fed with a rectangular wave guide with $TE_(10)$ mode.Take δ =0.1λ in the E plane and 0.25λ in the H-plane.Calculate the HPBWin both E and H planes, directivity and aperture efficiency? [16]

8. (a) Derive the relationship between Directive Gain, Radiation Resistance and Effective Length.

   (b) Calculate the beam widths in the x-y and y-z planes of an antenna the power pattern of which is given by $U(\theta,\phi) = \begin{matrix} \sin^2\theta \sin\phi & 0 < \pi/2; \;\; 0 \le \phi \le \pi \\ 0 & 0 < \theta < \pi/2; 0 \le \phi \le \pi \end{matrix}$ [8+8]

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