First Semester M.Tech. Degree Examination, June/July 2015
Antenna Theory and Design

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1. a. Show that an ideal dipole is 50% more directive than an isotropic antenna. **(06 Marks)**
   b. Define radiation efficiency of an antenna. How is it related to radiation resistance of an antenna? **(04 Marks)**
   c. Define the following with respect to antenna:
      i) polarization   ii) Axial ratio   iii) Tilt angle **(06 Marks)**
   d. An AM car antenna has a monopole antenna 1.575 m long and 0.159 cm diameter operating at 1 MHz. Assuming its ohmic resistance to be 0.074Ω, calculate its radiation efficiency. **(04 Marks)**

2. a. Describe a straight wire dipole antenna and derive an expression for its normalized electric field pattern when its length $= \lambda/2$ m. **(06 Marks)**
   b. Describe the principle of Yagi-Uda antenna. What are the parameters that affect the gain and directivity of this antenna? **(04 Marks)**
   c. Write a note on microstrip antenna feed methods. **(10 Marks)**

3. a. Derive an expression for the array factor of a uniformly excited equally spaced linear array. Explain the significance of the array factor. **(10 Marks)**
   b. Describe the effect of current distribution on non-uniformly excited equally spaced linear arrays. **(06 Marks)**
   c. Describe salient features of phased arrays. **(04 Marks)**

4. a. Explain the radiation characteristics of a travelling wave antenna, V-antenna, Rhombic antenna and a beverage antenna. **(12 Marks)**
   b. A 10-turn axial mode Helic antenna operates at a center frequency of 8 GHz, circumference of the helix is 0.92λ and its pitch angle is 13°. Calculate the spacing between the helix turns, the HPBW in degrees and gain in dB of the helix. **(08 Marks)**

5. a. How are Gain and Directivity of a Reflector antenna computed? Describe the formulae used. **(10 Marks)**
   b. What is a Huygens source? How are feed antenna matched to the reflector? **(06 Marks)**
   c. Write a note on dual reflector antennas. **(04 Marks)**

6. a. Describe a general feed model of a reflector model. How is it used to design a feed antenna? **(08 Marks)**
   b. Differentiate between antenna analysis, antenna design and antenna synthesis problems. **(06 Marks)**
   c. Explain the general principles involved in antenna synthesis. **(06 Marks)**

7. a. Describe the Woodward-Lawson sampling method of synthesizing a line source excitation, with an example pattern. **(10 Marks)**
   b. Compare Woodward-Lawson method with Fourier transform method. **(04 Marks)**
   c. Describe the Pocklington's integral equation. **(06 Marks)**

8. Write short notes on the following:
   a. FTTD method **(10 Marks)**
   b. Wedge diffraction theory **(10 Marks)**

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First Semester M.Tech. Degree Examination, June/July 2015
Advanced Digital Communication

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1   a.   Draw and explain the signal space diagram for coherent binary PSK system. Explain the concept with block diagram.   **(10 Marks)**
    b.   Derive probability of symbol error for rectangular M-ary QAM signal constellation. Compare the performance for different values of M and indicate the SNR.   **(10 Marks)**

2   a.   Derive probability of error for binary modulation, considering binary antipodal signals.
                                                                                  (10 Marks)
    b.   Compare different digital modulation techniques in terms of SNR fixed data rate or fixed band width.   **(10 Marks)**

3   For the convolution encoder shown in the Fig.Q3 below, draw the state diagram, tree diagram and trellis diagram. Find the output sequence for the input sequence 101101 and give relevant explanation.
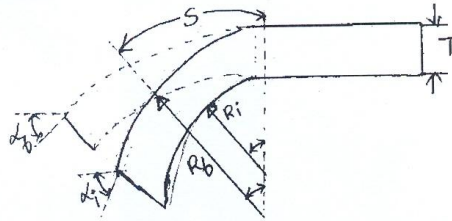

Fig.Q3   **(20 Marks)**

4   a.   Develop a discrete time model for a band limited channel of inter symbol interference with AWGN.   **(10 Marks)**
    b.   What is self recovery/blind equalization? Explain with any one stochastic gradient algorithm for blind equalization.   **(10 Marks)**

5   a.   With a relevant block diagram, explain in detail the working of predictive decision feedback equalizer.   **(10 Marks)**
    b.   Explain with relevant details, the RLS algorithm for performing the optimization in adaptive equalizer.   **(10 Marks)**

6   a.   Write an explanatory note on the model of spread spectrum digital communication system.
                                                                                  (10 Marks)
    b.   Derive an expression for SNR ratio in terms of processing gain, coding gain and jamming margin in a direct sequence spectrum system.   **(10 Marks)**

7   a.   Explain in detail the characteristics of fading of multipath channels.   **(10 Marks)**
    b.   Give the mathematical model for transfer function of fading channel.   **(10 Marks)**

8   Write explanatory note on:
    a.   Turbo equalization   **(07 Marks)**
    b.   Time hopping SS   **(07 Marks)**
    c.   Multiple antenna systems   **(06 Marks)**

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