7E4046

B. Tech. VII Semester (Main/Back) Examination 2014
ELECTRONICS & COMMUNICATION # ⑦EC④

WIRELESS COMMUNICATION

Time : 3 Hours   Min. Passing Marks : 24   Maximum Marks : 80

Instruction to Candidates :

*Attempt any five questions, selecting **one** question from **each** unit. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit–'I'

1. (a) Describe the models of multipath faded radio signals.

    (b) What is the delay spread bound τ_{max} of a 220 MHz public land mobile radio (PLMR) system if $P_T = 1$ watt (+30 dBm) and $P_{R\ min} = -90$ dBm? How much is τ_{max} if the sensitivity of the receiver is improved to $P_{Rmin} = -100$ dBm? Why does increased sensitivity or increased system gain, $G_S = P + P_{R\ min}$, lead to a higher delay-Spread bound. **[8+8=16]**

OR

1. (a) Compare similarities and differences in the fundamental concepts of a direct-sequence spread-spectrum (DS-SS) system versus a frequency hopping spread-spectrum (FH-SS) system.

    (b) The data rate (Source or information rate) of DS-CDMA product is $f_b = 10$ Kb/s. The spreading rate or chip rate is $f_c = 10$ mb/s. How much is the jamming margin Mj if an output $(S/N)_0$ of 12 dB is required for a bit error rate (BER) = 10^{-6} performance. **[8+8=16]**

Unit–'II'

2. Determine the transmitter power required in an LOS microwave link operating at FDM mode, with a path length of 60 Km and a carrier frequency of 2GHz. The FM receiver's modulation index is 0.5, three modulation frequency is 5 MHz, and the receiver noise figure is 5dB. The transmitter and receiver antenna diameters are 1 m .... and branch losses are 5dB. **[16]**

OR

2. A line of sight microwave link is to be established west of Chicago. The topographic survey of the site indicates a 330m elevation. Additional survey data show physical obstacles along the selected path, with the tallest at 25 m. Compute the antenna tower height for a 55-km length and a link operating frequency of 1.8 GHz. **[16]**

Unit–'III'

3. (a) Define briefly the operation of a time-division multiple-access (TDMA) scheme.

    (b) A communication satellite system is used exclusively for voice signal transmission, it employ an 8-psk modulation scheme with a spectral efficiency of 3.356 b/8/Hz, corresponding to an error power (P_e) of 10^{-8} while maintaining a C/N equal to 21.5 dB of earth station transmit with TDMA one burst per frame for a frame period of 2 ms, determine the maximum number of voice channels the transponder bandwidth can accommodate if the total number of guard and preamble bits is 680. **[16]**

OR

3. (a) Describe the CDMA systems and what are the advantages and disadvantages of using CDMA for a cellular network.

    (b) Calculate the capacity and spectral efficiency of the DS-CDMA system with an omnidirectional cell using the following data : Bandwidth efficiency = 0.9, frequency reuse efficiency = 0.45, capacity degradation factor = 0.8, voice activity factor = 0.4, information bit rate = 16.2 kbps, $E_b/I_0 = 7$ dB, one way system bandwidth = 12.5 MHz. Neglect other sources of interferences. **[8+8=16]**

Unit–'IV'

4. (a) Describe the operation of mobile IP.

    (b) List and briefly define. The capabilities provided by mobile IP.

    (c) Describe the wireless protocols **[6+5+5=16]**

OR

4. (a) What is the difference between a single cell and a multiple-cell wireless LAN?

    (b) List and briefly define the IEEE 802 protocol layers.

    (c) What error correction schemes are used in Bluetooth baseband **[6+5+5=16]**

Unit–'V'

5. (a) List the main components of an earth station transmitter. With the assistance of a block diagram, briefly explain its function of operation.

    (b) With the assistance of a block diagram, describe the function of a satellite earth station down-converter. **[8+8=16]**

OR

5. (a) Define satellite access? Describe the difference between single and multiple access.

    (b) In a communication satellite link, the modulation scheme used in QPSK with a spectral efficiency of 1.85 b/s/Hz. Compute the maximum transponder channel capacity, assuming a 36 MHz transponder bandwidth. **[8+8=16]**