

N.B. : Attempt any five questions.

1. (a) Describe in details the task of PN sequence in a multiuser DSSSS cell telephony system. Why there is a processing gain in the system ? How processing gain is defined ? Explain clearly. 14
- (b) The SNR required at the detector to achieve a reliable communication in a DSSSS system is 13 dB. If the interference to signal power at the receiver is 20 dB, determine the processing gain required to achieve a reliable communication. 6
2. (a) Explain why Gold, Kasami a Walsh sequences preferred over PN code sequence in a DSSSS system. Explain how they reduce intra and inter interference with in a cell and they help to improve the output SNR of a receiver and specially in a RAKE receiver. 10
- (b) Consider the case where eight chips per bit are used to generate the Walsh functions. Stations ABC and D are assigned the chip sequence 01010101, 00110011 01100110, and 00001111 respectively. The stations use the chip sequence to send a '1' bit and use negative chip sequences to send a '0' bit (e.g. A uses 10101010 to send the '0' bit and soon) All chip sequences are pairwise orthogonal and are transmitted by their binary values.(i.e. + 1 for 1 and - 1 for 0). The receiver at station C receives transmissions in sequence from the stations C, C + D, A + B + C, A + B, A + B + C as -- 1 -, -- 11, 111 -, 11 -- and 110 - respectively, (-) means no transmission from that station. What bit sequence receiver at station C receives ? 10
3. (a) For a DSSSS system derive relations among, processing gain, input signal to interference ratio, output signal to interference ratio and E_b/N_0 , where E_b is the energy per bit and N_0 the noise power spectral density at the output. Hence derive an expression for the capacity CDMA cell system. 10
- (b) Estimate the number of mobile users that can be supported by a DSSSS system that uses R.F. bandwidth of 1.25 MHz to transmit data at 9.6 kbps. Assume $E_b/N_0 = 6$ dB, interference from neighbouring cell $\beta = 60\%$ voice activity factor $\nu = 50\%$ and power control accuracy factor $\alpha = 0.8$. 10
4. (a) Explain how a roaming subscribers in a DSSSS cell can influence the capacity of the cell, create an interference hole in the cell and also can produce near far effect to downgrade performance of the cell. Explain how these drawbacks can be mitigated by proper power control of the transmitters in the cell. 6
- (b) Describe in details the open-loop and closed-loop system of power control in a DSSSS system. 14
5. (a) What are the bandwidths and the chip rates that are used in WCDMA system and how they compare with IS-95, CDMA ? In what way 1 MT 2000 differ from them ? Explain in details. 8
- (b) Why does the WCDMA uses Walsh codes in forward and reverse channel to for separating the users while IS-95 CDMA does this only in the forward channel ? Explain with proper diagram how IS-95 CDMA separates the users in the reverse channel. 12
6. (a) What are the key advantages of WLL over wired subscribers loop ? What are advantages of the millimeter wave transmission that is used in WLL, compared to the transmission of longer wavelength ? What are the disadvantages ? 8
- (b) What are principle advantages of OFDM ? Why it is used in WLL ? Explain with block diagram how OFDM are produced and how they are detected. 12
7. (a) Explain what is a Bluetooth system ? At what frequency it can be used ? Explain the Bluetooth architecture and the four states, to terminals can take and explain the differences in these states. In general term what applications areas are supported by Bluetooth. 12
- (b) What are the similarities and differences between the FHSS used in the IEEE 802.11 and in the Bluetooth in terms of data rate, modulation technique, available frequencies for hopping, speed of hop and number and the pattern of hops ? Explain. 8