Question Paper

Exam Date & Time: 27-Jul-2022 (09:00 AM - 12:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY (COMPUTER AND COMMUNICATION ENGINEERING)
SIXTH SEMESTER B.TECH MAKEUP EXAMINATIONS, JULY 2022

WIRELESS COMMUNICATION AND COMPUTING [ICT 3272]

Marks: 50 **Duration: 180 mins.**

Instructions to Candidates:
Answer ALL questions.
Missing data, if any, may be suitably assumed

1) A) Consider a scenario where the handset is assumed to be on a moving vehicle moving away from the base station (assume velocity of movement = v m/s) towards a reflecting surface as shown in Figure Q. 1A. Derive the channel model and obtain the expression for the Doppler shift and the Doppler spread. (5)

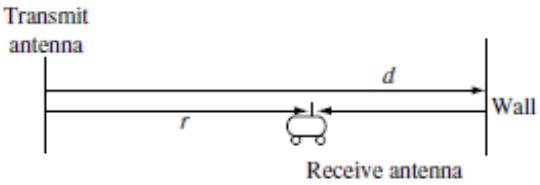

Figure Q. 1A

B) List and explain the reasons for handoff of cell-phone in the cellular network. (3)

C) Compare FDMA and CDMA technologies. (2)

2) A) A mobile user is moving from Cell Site A to Cell Site B at the speed of 30km/hr and the radius of the cell site is 900m. Assume that the handoff occurs over a duration of 7 seconds at a path loss of 4 dB. Calculate the minimum required margin of handoff and comment on the effect of margin on the performance of cellular systems. [Assume d_0 =1 P_0=0dBm]. (5)

B) A sequence generator is constructed using a polynomial h(X) = X^5 + X^2 + 1 over GF(2). List the properties that the generated sequence should satisfy to qualify as maximum-length PN sequence. (3)

C) Write the difference between cordless and cell-phone. (2)

3) A) Explain the slow and fast frequency hop spread spectrum (FHSS) methods. Consider a scenario where data symbols are defined with 8FSK modulation with Δf as message bandwidth, and a 2-bit PN sequence generator used is generating a pattern of 1 0 0 1 1 1 0 0 repeatedly. Assuming chip length Tc = 2 x Ts where Ts is the 8FSK symbol duration, draw the FHSS pattern for the input data bit pattern 0 1 0 1 1 0 1 1 0 0 0 1 1 1 1 0 0 0. (5)

B) What are the limitations of general packet radio systems? (3)

C) Explain the concept of radio line-of-sight communication. (2)

4) How does the *dynamic source routing protocol* establish the route to the destination node? (5)

A)

B) A recorded conversation needs to be transmitted using a PN spread spectrum system. The input is bandlimited to 4kHz and uses 256 quantization levels. Find out the chip rate required to obtain a processing gain of 10dB. Given that the recorded conversation is of one hour, find out the number of shift registers used in PN generator. (3)

C) Explain the leach routing protocol with a neat diagram. (2)

5) Explain the concept of diversity and the advantages of using diversity in wireless communication. Explain each of the following diversity concepts. (5)

A)

1.

a. Simulcast

b. Frequency Diversity

c. MIMO

B) Write the stepwise mobile node registration procedure in the cellular network. (3)

C) Consider a mobile radio system at 900-MHz carrier frequency, and with 25-kHz bandwidth, that is affected only by thermal noise. The transmission power Tx is 15 dBm and cable loss at both side is 2 dB. Antenna gains at the Tx and Rx sides are 14 dBi and 13 dBi respectively. The path loss for the coverage range of 5 km is -114 dB and the receiver side sensitivity is 89 dBm. Estimate the RX signal level and the link margin of the network. (2)

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