## **Question Paper**

Exam Date & Time: 05-Jul-2023 (02:30 PM - 05:30 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

VI SEMESTER B.TECH. (COMPUTER COMMUNICATION ENGINEERING)

MAKE-UP EXAMINATIONS, JULY 2023

WIRELESS COMMUNICATION AND COMPUTING [ICT 3272]

Marks: 50

Answer all the questions.

Duration: 180 mins.

Descriptive

Section Duration: 180 mins

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

- 1A)Suppose a cellular service provider decides to use a TDMA scheme that can tolerate a signal-to-<br/>interference ratio of 26 dB in the worst case. Find the optimum value of cluster size N in case of<br/>[Assuming n = 5].(5)
  - i. Omnidirectional antenna
  - ii. 90-degree sectoring
  - iii. 60-degree sectoring
  - iv. Which sectoring will be better?
  - v. What are the advantages of sectoring?
- 1B) The cellular operator chooses which electromagnetic spectrum to operate the cellular network. Give (3) the four technical reasons why cellular operators are not choosing low band or high band in electromagnetic spectrum.
- 1C) The loss in a cable is usually defined in decibels per kilometre (dB/km). If the signal at the (2) beginning of a cable with -0.3 dB per km has a power of 2 mW, what is the power of the signal at 5 km?
- 2A) How does the *dynamic source routing protocol* establish the route to the destination node? (5)
- 2B) Suppose the two cells in cellular network are using same frequency at the closest distance between (3) them is 5 KM and the radius of the cell is 700 meters.
  - i. Calculate the cluster size with <sup>th</sup> and j<sup>th</sup> value.
  - ii. Draw the layout of cell cluster with respect to frequency reuse factor.
- 2C) Solve the numerical problems:
  - i. If the length of the packet is 1 million bytes and the bandwidth of the channel is 200 Kbps. What is the transmission time of a packet sent by a station?
  - ii. What is the length of a bit in a channel with a propagation speed of 2 x 10 $^{\circ}$  m/s if the

(2)

channel bandwidth is 10 Mbps ?

3A)	Justify the design goals of the cellular digital packet data.	(5)
3B)	Demonstrate the Code Division Multiple Access signal encoding and decoding methodology for data 1011010110 with the system designed with 3 users assigned. The chip codes are 101100, 011110 and 110110. The chip codes are to be used with the bipolar signal representation.	(3)
3C)	Evaluate the directional gain resulting from a parabolic antenna with a diameter of 4 meters used in the Transmitter station operating at 6 GHz. Consider the distance between the stations is 10 km.	(2)
4A)	Demonstrate the different digital data encoding methods with representative signal constellations. For the digital data 10010011000 plot the encoded signal representation using the following digital signalling methods: BPSK, 4FSK.	(5)
4B)	Develop a channel model for a wireless communication system where the transmitter and receiver are both fixed and are stationed at a distance "d" meters apart. Also, a reflective surface is located adjacent to the receiver at a distance of "d0" meters from the receiver and the total distance between the transmitter and the reflective surface is ("d + d0") meters.	(3)
4C)	Compare and contrast the line-of-sight propagation method with the ground wave propagation method with respect to wireless communication.	(2)
5A)	Consider a maximum length sequence generated using the polynomial $p(X) = 1 + X^2 + X^3$ . Prove that the ML sequence generated satisfies all the test conditions that are to be qualified for the pseudo-random sequence.	(5)
5B)	For an input data stream 111000101111110110001000, illustrate the slow frequency hop spread spectrum method using the frequency allocation table. Assume that input is encoded using the 4-FSK data encoding method, and a three-bit PN sequence generator used produces the bit stream 110110001000111000. Consider the clock signal duration of PN generator equal to two 4-FSK symbol duration.	(3)

5C) Discuss the direct sequence spread spectrum method with neat transmitter and receiver models. (2)

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