GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2024

Subject Code: 2171004   **Date: 30-05-2024**

Subject Name: Wireless Communication

Time: 02:30 PM TO 05:00 PM   **Total Marks:70**

Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

			Marks
Q.1	**(a)**	Define the following terms regarding wireless communication: (1) Half duplex channel (2) Mobile Switching Center (3) Roamer	**03**
	(b)	What is the core concept of the cellular communications? Distinguish between a cell and cell site.	**04**
	(c)	Describe the cell sectoring concept with examples and its importance in communication.	**07**
Q.2	**(a)**	Compare Wi-Fi and Wi-MAX.	**03**
	(b)	A mobile communication system is allocated RF spectrum of 25MHz and uses RF channel bandwidth of 25 kHz. so that a total number of 1000 voice channels can be supported in the system. (a) If the service area is divided into 20 cells with a frequency reuse factor of 4, compute the system capacity. (b) The cell size is reduced to the extent that the service area is now covered with 100 cells. Compute the system capacity while keeping the frequency reuse factor as 4.	**04**
	(c)	Derive an expression for a ground reflection model assuming distance between transmitter and receiver antenna is very large compare to heights of the antennas.	**07**

OR

	(c)	If a total of 33 MHZ of bandwidth is allocated to a particular FDD cellular telephone system which uses two 25 KHZ simplex channels to provide full duplex voice and control channels, compute the number of channel available per cell if a system uses (a) four-cell reuse, (b) seven-cell reuse, and (c) 12–cell reuse. If 1MHZ of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each for each of the three systems.	**07**
Q.3	**(a)**	A Wi-Fi system operates at 1 Mbps. Calculate the data transfer time required for a 20 KB file.	**03**
	(b)	Explain: (a)Co-channel interference (b) Handoff (c) Umbrella cell approach (d) Cell dragging	**04**
	(c)	What is meant by Hand off and explain different Hand off strategies. How handoff operation is performed while mobile moves into a different cell while a conversation is in progress. Discuss the cases for proper and improper handoff situations.	**07**

OR

Q.3	**(a)**	Explain the three basic propagation mechanisms which impact the propagation of signal in a mobile environment.	**03**
	(b)	Explain in detail the free space propagation model.	**04**

	(c)	Derive an expression for a ground reflection model assuming distance between transmitter and receiver antenna is very large compare to heights of the antennas.	**07**
Q.4	**(a)**	Explain the following term with reference to CDMA. 1. Power control; 2. Soft Handoff; 3. Frequency hopping.	**03**
	(b)	Explain how power control is achieved in CDMA.	**04**
	(c)	Compare CDMA, FDMA and TDMA in terms of concept, key resources, sharing of resources, Bandwidth efficiency, system flexibility and system complexity	**07**

OR

Q.4	**(a)**	Explain Trunking and Grade of Service in brief.	**03**
	(b)	Explain MS registration and authentication in GSM.	**04**
	(c)	Describe: Time Division Multiple Access (TDMA) in detail. Write the equation for efficiency of TDMA and the number of channels in TDMA system.	**07**

Q.5	**(a)**	Discuss the concept of spread spectrum.	**03**
	(b)	Explain Bluetooth technology with technical specification.	**04**
	(c)	Prove that for a regular hexagonal geometry, the frequency reuse ratio and cluster size are related by the relationship as $Q = (3N)^{1/2}$, where $N = i^2 + j^2 + ij$.	**07**

OR

Q.5	**(a)**	Write a short note on RAKE receiver with neat diagram.	**03**
	(b)	Describe the concept of Doppler effect with relevant mathematical expressions.	**04**
	(c)	Draw and explain OFDM transmitter and receiver with its importance in communication.	**07**

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