GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER- VII EXAMINATION-SUMMER 2023

Subject Code: 3171004   **Date: 28/06/2023**

Subject Name: Wireless Communication

Time: 10:30 AM TO 01:00 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)**	Compare 2G, 3G and 4G Cellular Mobile Networks.	**03**
	(b)	Starting from free space propagation model, derive the expression for obtaining Path loss in dB.	**04**
	(c)	Mention the applications and scope of wireless communication.	**07**
		In that context define BS, 3GPP, Forward channel and Full Duplex system.	
Q.2	**(a)**	State the full forms of the following acronyms:	**03**
		WLAN, LTE, OFDM	
	(b)	Compare and contrast co-channel interference with adjacent channel interference.	**04**
	(c)	Consider the knife-edge for the given two cases, (a) h = 25 m, (b) h = 0. Consider wavelength = 0.33 m, $d_1 = d_2$ = 1 Km. The diffraction loss obtained for the above cases are 22 dB and 6 dB respectively.	**07**
		For each of the cases, find the fractional diffraction parameter and identify the Fresnel zone within which the tip of the obstruction lies.	

OR

	(c)	Describe a 2-Ray ground reflection model with reflection diagram.	**07**
		For a 2-Ray Ground Reflection Model, prove that the total Electric field Intensity evaluated at time of the ground reflected ray, received at the receiver is given by:	

$$E_r^{total} = \frac{E_0 d_0}{d} \left[Cos \left(\theta_\Delta - 1 \right) \right] \quad \text{where,}$$

θ_Δ is the Phase difference between direct ray and the ground reflected ray.

Q.3	**(a)**	Draw the Power delay profile of the received signal with excess delay. With respect to it, define Power delay profile and maximum delay time spread	**03**
	(b)	Analyse the concept of fading in a wireless channel and hence, enlist the factors responsible for small-scale fading.	**04**

	(c)	For a regular hexagonal geometry show that co-channel reuse ratio is $Q = (3N)^{1/2}$, where $N = i^2 + j^2 + ij$.	**07**
		OR	
Q.3	**(a)**	State the significance of hexagonal cell geometry in cellular service area.	**03**
	(b)	Describe the concept of umbrella cell approach in mobile communication.	**04**
	(c)	State the specifications for finding the median Path Loss using Okumura's model. Explain the model with various cases.	**07**
Q.4	**(a)**	Describe the Concept of cell sectoring in brief.	**03**
	(b)	For a digital cellular system, carrier frequency is 900 MHz and mobile velocity is 70 Km/hr. Calculate the received frequency if the mobile	**04**
		(a) is directed towards the transmitter and	
		(b) In the direction perpendicular to the direction of arrival of the transmitted signal.	
	(c)	Draw and describe the GSM system architecture.	**07**
		OR	
Q.4	**(a)**	What is power control in CDMA?	**03**
	(b)	What are multiple access techniques? Compare FDMA, TDMA and CDMA as multiple access technologies.	**04**
	(c)	Describe cell splitting and its significance for enhancing channel capacity with necessary diagram and equations.	**07**
Q.5	**(a)**	Explain hand-off with a neat and clear diagram. Also discuss practical hand-off issues	**03**
	(b)	Starting with the concept of ISI, deduce an expression to obtain the relationship between coherent bandwidth and coherent time in time domain.	**04**
	(c)	Describe the working of Ultra-Wide Band radio. Discuss the features, advantages and disadvantages of UWB technology.	**07**
		OR	
Q.5	**(a)**	Describe Rayleigh Fading as a multi-path fading model.	**03**
	(b)	Enlist the security issues and challenges related to 5G Wireless network.	**04**
	(c)	Describe the working of a Software Defined Radio. Discuss the features, advantages and issues associated with it.	**07**