Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2024

Subject Code: 3171004 Date: 28-05-2024

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 following terms with respect to wireless communication : (1) Full duplex systems (2) half duplex systems (3) hand off	**03**
	(b)	Define following terms with respect to wireless communication : (1) Base station (2) Forward channel (3) Reverse channel (4) Simplex systems	**04**
	(c)	With neat diagram explain the concept of: frequency reuse.	**07**
Q.2	**(a)**	If a spectrum of 30MHz of is allocated to a wireless FDD cellular telephone System which uses two 25 KHz simplex channels to provide full duplex voice and Control channels; compute the number of channels available per cell if a system uses: (1) Four cell reuse (2) seven cell reuse and (3) 12 cell reuse.	**03**
	(b)	Explain The third Generation Wireless Networks.	**04**
	(c)	With neat diagram explain various upgrade paths for 2G technologies.	**07**
		OR	
	(c)	Explain Trunking and Grade of service in detail. Also discuss the traffic intensity with the help of necessary equation.	**07**
Q.3	**(a)**	With neat diagram explain Umbrella cell approach clearly.	**03**
	(b)	Explain Channel planning for wireless communication.	**04**
	(c)	With neat diagram explain Cell Splitting in detail.	**07**
		OR	
Q.3	**(a)**	Explain Carrier Sense Multiple Access (CSMA) protocols briefly.	**03**
	(b)	Write a short note on: Repeaters for range extension in cellular systems	**04**
	(c)	With neat diagram explain Sectoring in detail.	**07**
Q.4	**(a)**	Find the Fraunhofer distance for an antenna with maximum dimension of 1 m and operating frequency of 900 MHz If antennas have unity gain, calculate the path loss.	**03**
	(b)	Explain Microcell Zone concept with neat diagram.	**04**
	(c)	If a transmitter produces 50W of power, express the transmit power in units of (1) dBm and (2) dBW. If 50W is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power in dBm at a free space distance of 100 m from antenna. What is Pr (10km)? Assume unity gain for the receiving antenna.	**07**
		OR	

Q.4 **(a)** Explain CDMA technique briefly with diagram. **03**

(b) Define: (1) diffraction (2) Scattering **04**

(c) Assuming free space propagation, a receiver is located 10 km away from a 50 W transmitter. The carrier frequency is 900 MHz, antenna gain at transmitter and receiver is 1 and 2 respectively, calculate: **07**

(1) Power received at receiver
(2) The magnitude of the E-field at the receiver antenna
(3) The power flux density
(4) The rms voltage applied to the receiver input. The receiver antenna has 50Ω impedance and is matched to the receiver.

Q.5 **(a)** Calculate the Brewster angle, for a wave impinging on poor ground, having a permittivity of $\varepsilon_r=4$ at the frequency of 100MHz.Also calculate the same for typical ground with permittivity of $\varepsilon_r=15$. **03**

(b) Draw the TDMA frame structure and explain it briefly. **04**

(c) Draw and explain GSM system architecture in detail. **07**

OR

Q.5 **(a)** Explain Frequency Division Multiple Access (FDMA) briefly. **03**

(b) With necessary equation Define: Doppler Shift. **04**

(c) A mobile is located 5 km away from a base station and uses a vertical $\gamma/4$ monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E field at 1 km from the transmitter is measured to be 10^{-3} V/m.The carrier frequency used for this system is 900 MHz **07**

(1) Find the length and the effective aperture of the receiving antenna.
(2) Find the received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 1.5 m above ground.

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