Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII EXAMINATION – WINTER 2015

Subject Code: 171004 **Date:16/12/2015**

Subject Name: wireless communication

Time: 10:30am to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define the following terms regarding wireless communication: **07**

(1) Control channel
(2) Half duplex channel
(3) Base station
(4) Mobile Switching Center
(5) Simplex systems
(6) Full duplex systems
(7) Reverse channel

(b) (1) With figure explain the concept of frequency reuse in detail. **07**
(2) With figure explain hand off scenario at cell boundary

Q.2 **(a)** If a signal to interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (1) n=4 (2) n=3 ? **07**
Assume that there are six co channel cells in the first tier and all of them are at the same distance from the mobile. Use suitable approximations.

(b) Explain the concept of Cell splitting in detail with figure. **07**

OR

(b) Explain the concept of sectoring in detail with figure. **07**

Q.3 **(a)** With necessary equations explain Free space propagation model in detail. **07**

(b) If a transmitter produces 50 W of power express the transmit power in units of (1) dBm and (2) dBW. **07**

If 50 watt 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 the antenna. What is P_r (10 km)? Assume unity gain for the receiver antenna.

OR

Q.3 **(a)** Assume a receiver located 10 km from a 50 W transmitter .The carrier frequency is 900MHz.Free space propagation is assumed.G_t=1 and G_r=2. Find: **07**

(1) The power at the receiver.
(2) The magnitude of E field at the receiver antenna.
(3) The rms voltage applied to the receiver input assuming that the receiver antenna has a purely real impedance of 50 Ω and is matched to the receiver.

(b) With figure explain Knife-edge diffraction model in detail. Write the Equation for diffraction gain. **07**

Q.4 **(a)** Describe the factors influencing small scale fading. **07**

(b) Consider a transmitter which radiates a sinusoidal carrier frequency of **07**

1850Mhz.For a vehicle moving 60 mph ,compute the received carrier frequency if the mobile is moving:

(1) Directly toward the transmitter.

(2) Directly away from the transmitter.

(3) In a direction which is perpendicular to the direction of arrival Of transmitted signal.

OR

Q.4	**(a)**	Describe briefly the types of small scale fading (based on multipath time delay spread)	**07**
	(b)	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)**	**(1)** If GSM uses a frame structure where each frame consists of 8 time slots and each time slot contains 156.25 bits and data is transmitted at 270.833 kbps in the channel find: (i) The time duration of a bit. (ii) The time duration of a slot. (iii) The time duration of a frame. (iv) How long must a user occupying a single time slot wait between two successive transmissions. **(2)** If a normal GSM time slot consists of 6 trailing bits, 8.25 guard bits, 26 training bits and two traffic bursts of 58 bits of data. Find the frame efficiency.	**07**
	(b)	Draw GSM system architecture and explain it in detail.	**07**

OR

Q.5	**(a)**	Write short note on Code Division Multiple Access (CDMA).	**07**
	(b)	Write short note on Frequency Division Multiple Access (FDMA). Describe non linear effects in FDMA.Also write equation for number of channels that can be simultaneously supported in a FDMA system.	**07**

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