Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER • 2014

Subject Code: 171004 **Date: 27-11-2014**

Subject Name: Wireless Communication

Time: 10:30 am - 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.**

Q.1 **(a)** Assume a 1 Amp-Hour battery is used on a cellular phone. Also assume that this phone draws 35 mA in the idle mode and 250 mA during call. How long the phone will work if the phone is not switched off and has one call of 3-minute every day? Repeat the calculation if there is one call of 3 minute every hour. Also calculate the maximum possible talk time available with this cellular phone. **07**

(b) A cellular system has 32 cells; each cell has 1.6 km radius and the system reuse factor of 7. The system is to support 336 traffic channels in total. Determine the total geographical area covered, the number of traffic channels per cell and total number of simultaneous calls supported by this system. **07**

Q.2 **(a)** In a two-ray ground reflection model, assume that phase difference must be kept below 6.261 radians for phase cancellation reasons. Assuming a receiver height of 2 m, and given a requirement that angel of incidence must be less than 5°, what are the minimum allowable values for the Transmitter-Receiver separation distance and the height of the transmitter antenna? Take the carrier frequency as 900 MHz. **07**

(b) For a regular hexagonal geometry show that co-channel reuse ratio is $Q= (3N)^{1/2}$, where $N= i^2+ij+j^2$. **07**

OR

(b) Compare HSCSD, GPRS & EDGE in terms of their channel bandwidth (in KHZ), duplexing technique (FDD or TDD), maximum raw data rate supported and name of carrier modulation used. **07**

Q.3 **(a)** What is a Fresnel Zone? **07**

A general design rule for microwave links is to have 55% clearance of the first Fresnel zone. For a 1 km link at 2.5 GHz, what is the maximum first Fresnel zone radius? What clearance is required for this system?

(b) Calculate the worst case carrier to interference ratio for a mobile receiver located at the boundary of its serving cell if it is under the influence of interfering signals from two nearest co-channels cells in a cellular system. Assume 3-sectors per cell and a reuse pattern of 4. **07**

OR

Q.3 **(a)** For an identical received power at the boundaries of original larger cell with radius R_0 and the new split cell with half the radius of the original cell, show that transmitter power of any of the new split cell must be 12 dB less than the original large cell. **07**

(b) Suppose that a mobile station is moving along a straight smooth surface between base stations BS1 and BS2. The distance between BS1 and BS2 is 2000 m. Assume that the received power in dBm at a Base station is given by $Pr=P_0-10*n*\log(d/d_0)$, where d is the distance between mobile station and base station in meters. P_0 is the power at distance d_0 from the mobile. Assume that P_0=0 dBm and d_0=1 m. Let n denote path loss exponent which is 2.9. Given that the minimum usable level of signal is -88dBm and the mobile is currently connected to BS1, determine the hand-off margin if hand-off time is 4.5 second and the mobile speed is 100 km/hr. **07**

Q.4 (a) Match the following terms with its most appropriate function/use **07**

Term	Function/use
VLR	Stolen phone numbers
HLR	Network and country codes
EIR	Current location of the subscriber
MSC	Verification of the SIM
IMSI	Identity of an user
SIM	Temporary storage
AuC	Handover

(b) Explain the following term with reference to CDMA **07**

1. Power Control
2. Soft hand-off
3. Frequency hopping

OR

Q.4 (a) Give complete classification of small scale fading and summarize the conditions for each type of small scale fading. **07**

(b) Explain the following diversity techniques briefly: **07**

1. Space diversity techniques
2. Frequency diversity techniques

Q.5 (a) Explain the salient features of ZigBee networks. **07**

(b) In an omnidirectional CDMA cellular system E_b/N_o required is 20 dB. If 100 users, each with a baseband data rate of 13 kbps are to be accommodated, determine the minimum channel bit rate of spread spectrum chip sequence assuming voice activity factor of 0.4. **07**

OR

Q.5 (a) Explain in details about architecture of UWB radio and its applications. **07**

(b) Determine frame efficiency of a TDMA frame structure used in GSM system. **07**

****