# **GUJARAT TECHNOLOGICAL UNIVERSITY** BE - SEMESTER-VII • EXAMINATION – SUMMER • 2014

Subject Code: 171004

**Subject Name: Wireless Communication** 

Time: 02:30 pm - 05:00 pm

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Derive an expression for a ground reflection model assuming distance between 09 transmitter and receiver antenna is very large compare to heights of the antennas.
  - (b) The received power at a distance of 100 km is 5 nw for a communication link. 05 Determine the received power at a distance 200 km for the same link. Assume free space propagation mechanism.
- **Q.2** (a) For the Knife-edge geometry of FIG.1 show that  $v=\alpha(2 \ d_1 \ d_2/(\lambda(d_1+d_2)))^{1/2}$ , 07 approximately. Assume  $d_1,d_2 >> h$ 
  - (b) If a baseband binary message with a bit rate of 100 kbps is modulated by an RF or carrier using BPSK, answer the following:
    a. Find the range of values required for the rms delay spread of the channel such that the received signal is a flat-fading signal
    b. If the carrier frequency is 5.8 GHz, what is the coherence time of the channel, assuming a vehicle speed of 30 miles/hr
    c. For your answer in part b, is the channel "fast" or "slow" fading?

### OR

(b) Approximately how large can the rms delay spread be in order for a binary modulated signal with a bit rate of 25 kbps to operate without an equalizer? What about an 8-PSK system with a bit rate of 75 kbps?

### Q.3 (a) Draw the architecture of GSM system and explain each block in brief. 07

(b) Suppose that a mobile station is moving along a straight smooth surface **07** between base stations BS1 and BS2. The distance between BS1 and BS2 is 2000 m. Assume that the received power in dBm at Base station is given by  $P_r=P_0-10*n*\log (d/d_0)$ , 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.

### OR

Q.3	<b>(a)</b>	For a seven cell reuse pattern and hexagonal cell geometry show that 120°	07
	<b>(b)</b>	sectoring improves signal to interference ratio by about 5 dB. Explain HSCSD for 2.5 GSM.	07
Q.4	(a) (b)	Explain in details about various channel assignment strategies. Describe the concept of Doppler effect with relevant mathematical expressions.	07 07

Date: 29-05-0214

# **Total Marks: 70**

- Q.4 (a) Consider two different cellular systems that share the following characteristics. 08 The frequency bands are 825-845 MHz for uplink and 870-890 MHz for the downlink. A duplex circuit consists of one 30 kHz channel in each direction. The systems are distinguished by the reuse factor, which are 4 and 19 respectively. For these systems, (i) Find the number of simultaneous communications that can be supported by a single cell in each system. (ii) Suppose that in each systems the cluster of cells (4,19) is duplicated 16 times, find the number of simultaneous communications that can be supported by each system. (iii)Suppose the average user makes 6 calls per 24 hours and mean call duration is 6 minutes, estimate the total number of users that can be supported by each system.
  - (b) Compare GSM, IS-136 and IS-95 standards in terms of modulation schemes, 06 multiple access schemes, frequencies used, physical channel bandwidth, number of users/ physical channel and typical power radiated by mobile stations using these standards. Give your answer in tabulated form.
- Q.5(a) Differentiate adhoc wireless networks from cellular networks.07(b) List advantages and disadvantages of CDMA compared to GSM.07

#### OR

- Q.5 (a) Draw the architecture of GPRS system and explain in brief about each block. 07
  - (b) What is software defined radio? List key features of software defined radio. 07 Also, mention its applications.



FIG.1

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