

**Concordia University**  
**Department of Electrical and Computer Engineering**  
**ELEC6141/ELEC464: Wireless Communications**  
**Midterm Exam**  
**Winter 2011**

1) In a cellular system, a 7-cell reuse pattern is used and the co-channel signal-to-interference ratio is 18 dB. Find the signal-to-interference ratio if a 12-cell reuse were used. (3 Marks) What would be the signal-to-interference ratio if  $120^\circ$  sectoring were used? (1 Mark)

2) A cellular system has 420 voice channels and uses 7-cell reuse. What is the total number of subscribers that it can accommodate if the number of cells is 350 and each subscriber generates 1 call per hour with an average holding time of 3 minutes and a blocking probability of 1% is required. (4 Marks)

3) In a communications link  $P_t = 10 \text{ W}$ ,  $G_t = 13 \text{ dB}$ ,  $G_r = 3 \text{ dB}$ ,  $h_t = 15 \text{ m}$ ,  $h_r = 2 \text{ m}$ , and  $F = 900 \text{ MHz}$ .

- a) Find the received power (in dBm) at a distance  $d = 4 \text{ km}$ . using two-ray model (2 Marks).
- b) Justify any approximation made in part (a) (1 Mark).
- c) Find the SNR (in dB) if the receiver's noise figure is 13 dB (2 Marks).
- d) Find the attenuation due to diffraction if there were a hill with the height of 50 m mid-way between the transmitter and the receiver (2 Marks).

4) A 900 MHz. cellular transmitter has an EIRP of 100 W. An AMPS receiver at a distance of 10 km. uses an antenna with the gain of 0 dB and has a noise figure of 10 dB. Find the probability that a SNR of 35 dB or higher is achieved at the receiver. Assume  $n = 4$ ,  $\sigma = 8 \text{ dB}$ , and  $d_0 = 1 \text{ km}$ . (5 Marks)

5) Consider a system using GSM standard over a multipath fading channel with the power delay profile shown in Figure 1. Is the channel frequency selective or flat fading? Why? (5 Marks)

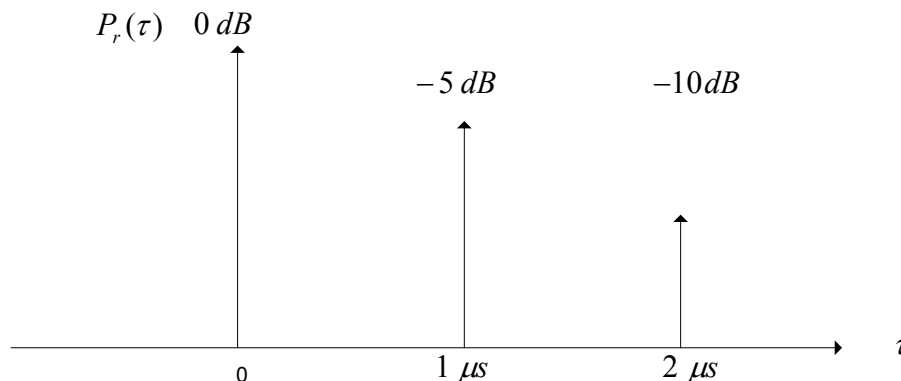


Figure 1