ELECTRICAL ENGINEERING DEPARTMENT

EEL860: Wireless Communications: Major Test: 9 May 2007: Time 2 hr: Max. Marks 50

Attempt all questions. Please be brief and to the point.

Q.1 Draw the psd of OOK signal. What fraction of the total transmitted power is in carrier component? Determine the practical BW require. for OOK and 8-ASK signal in terms of data rate. (5)

Q.2 Consider a BPSK and a QPSK transmission syste

(a) If the BER in the BPSK system is 10^{-4}, what is BER and symbol error rate in the QPSK system?

(b) If the minimum BW required for BPSK is 60 KHz, what is the minimum BW required for QPSK transmission? What is the relationship between the spectral efficiencies of the BPSK and QPSK system

(c) If you were to use an 16-level PSK system instead of a QPSK transmission system, what would be the minimum BW required?

(d) If you were to use an MSK system instead of a QPSK transmission system, what would be the resultant transmission BW required. (8)

Q.3 Consider a transmission system where the receiv signal $r(t)$ is expressed as

$$r(t) = A \, s(t) + n(t)$$

where $s(t)$ is the transmitted signal and $n(t)$ i white Gaussian noise of psd $N_0/2$. The parameter A is a scaling factor that is a random variabl having the following pdf

$$f(a) = 0.1 \, \delta(a) + 0.5 \, \delta(a-1) + 0.4 \, \delta(a-2)$$

calculate the average BER if a matched filter is used at the receiver and modulation is BPSK. (7)

Q.4 Explain the term long-term fading and short-te fading. Compare Rayleigh and Rician fading channels and explain why Rician channels

Q.5 Two service providers A and B provide cell. service in an area. Provider A has 100 cells with 20 channels/cell and B has 35 cells with 54 channel cell. Find the number of users that can be support by each provider at 2% blocking, if each user averages two calls/hr at an average call durati of 3 minutes.

(5)

Q.6 (a) Two senders A and B want to send data and they are assigned following unique & orthogon key sequences

A_k: 0 1 0 0 1 1 and B_k: 1 1 0 1 0 1

The user A wants to send bit '1' and user B bit '0'. The binary '0' is encoded as -1 and binary '1' as +1. Determine the transmitted sequence C.

(b) A receiver wants to receive data from user A demonstrate how will it detect and what is the threshold level?

(c) Assume that strength of signal from sender B is 5 times of A's strength, can the receiver still detect the data of sender A correctly?

(d) Add noise signal (+1, -1, 0, +1, 0, -1) to the transmi signal C. In that case, can the receiver detect t signal from sender A correctly?

(8)

Q.7 (a) Draw and explain the schematic diagram of OFDM transmitter for QAM input signal.

(b) Explain the function of Decision Feedback Equalizer. Under what conditions, it offers significant advantages over the linear equalize

(c) Why space-time codes are important in wireless communication system? With one receiving antenna, how many transmitting antenna should be used to obtain almost full diversity gain?

(d) Give the merits and demerits of MIMO channels. In IEEE 802.11n WLAN standard, what is the basic modulation format?