METCE EXAMINATION, 2018
(1st Semester)
Advanced Digital Communication

Time: Three hours
Full Marks: 100

Write all the parts of a question in the same place
Answer any five questions
All the questions carry equal marks

1. a) Discuss the need for Superposition Mapping (SM) over the conventional mapping schemes. (4)

   b) Draw the structure of Superposition Mapping scheme and explain its principle of operation. (2+6)

   c) Explain the Equal Power Allocation (EPA) scheme of Superposition Mapping. Also discuss the mapping rule for SM-EPA in a tabular form (consider number of input code bits is equal to 4). (2+4)

   d) Mention both merits and demerits of SM-EPA. (2)

2. a) How will you train a Linear Adaptive Equalizer? (8)

   b) Develop the structure of a Two-stage Lattice Equalizer and derive the expressions of the outputs of this filter. Hence explain the operation of a Lattice Equalizer. State the advantages of this type of Equalizer. (4+6+2)

3. a) What do you mean by Diversity? (4)

   b) State the differences between Small Scale Fading and Large Scale Fading. (5)

   c) Explain the principles of operation of Feedback Equalizer and Maximal Ratio Combining techniques. (4+5)

   d) Compare the performance of the Maximal Ratio Combining with the Selection Diversity. (2)

4. a) Develop the model of an Adaptive Modulation and Coding (AMC) system using "Channel State" approach for OFDMA environment. (10)

   b) Explain that the Maximum Likelihood Sequence Estimation technique can be effectively used to compensate the deep fading in wireless channel. (10)

5. a) Express the 8-ary PSK signal set in terms of basis signals. Hence draw its constellation diagram. (2+6)

b) Write down the expressions for the transfer function and impulse response of Gaussian pulse-shaping filter. Also mention the features of this type of filter.(3+5)

c) State the disadvantages of Nyquist pulse-shaping filter. (4)

6. Explain the principles of operation of the following modulator/demodulator: (6+7+7)

a) MSK Modulator

b) π/4 shifted QPSK Modulator

c) Base-band Differential Demodulator for π/4 shifted QPSK

7. a) How is orthogonality maintained in an OFDM system? (6)

b) Draw the block diagrams of OFDM Transmitter and Receiver and explain the function of each block. (8)

c) How does an OFDM system handle the problem of Inter-symbol Interference? (6)

8. a) OQPSK can handle system nonlinearity better than QPSK-explain. (6)

b) Derive the equivalence condition between the pre-detection band-pass filter and post-detection low-pass filter for coherent demodulation. (8)

c) Draw the neat sketch of an Eye diagram and explain the significance of each part. (6)