



Answer the following questions:

Question 1: (Answer two points only)

(10 Marks)

- Prove that the envelope of narrowband noise has a Rayleigh distribution, while that of a signal immersed in narrowband noise has a Rician distribution.
- Compare between the different versions of optical OFDM.
- Discuss the channel impairments in underwater acoustic communications and explain how to avoid these impairments.

Question 2: (Answer two points only)

(10 Marks)

- What is the basic concept of cancelable biometrics? Explain two cancelable biometric systems based on encryption and bio-hashing.
- Define the PAPR problem in wireless communication systems. Explain how the wavelet transform can be implemented in PAPR reduction in multi-carrier communication systems.
- What is meant by adaptive modulation? Why is it needed in wireless communication systems? Explain the different scenarios of adaptive modulation. Illustrate how the cepstral analysis can be used in adaptive modulation classification.

Question 3: (Answer two points only)

(10 Marks)

- Explain why the OFDM is implemented with IFFT and FFT blocks. What are the advantages of OFDM from the ISI and equalization perspectives? What is the difference between OFDM and SC-FDMA systems?
- Explain the steps of iris-based security system. Show how to use sectorized random projection to build a secure iris recognition system.
- Compare between optical OFDM, acoustic OFDM, and wireless OFDM.

Question 4: (Answer two points only)

(10 Marks)

- Discuss the main differences between traditional network and Software Defined Network (SDN), their architectures, advantages, and disadvantages.
- Discuss the main differences between NOMA, Single-Carrier NOMA, Multi-Carrier NOMA, Cooperative NOMA, and conventional OMA techniques. Mention their features, benefits, and limitations.
- Discuss briefly the Visible Light Communication (VLC) system, its advantages, its limitation, and its applications. Compare between the VLC and infrared communication systems.

