Menoufia University Faculty of Electronic Engineering Dept. of Electronics and Electrical Communications		Advanced Communication Systems Date: 9-6-2019 Time allowed: 3 hours

Answer the following questions:

Question 1: (Answer two points only)   (10 Marks)

a- Prove that the envelope of narrowband noise has a Rayleigh distribution, while that of a signal immersed in narrowband noise has a Rician distribution.

b- Compare between the different versions of optical OFDM.

c- Discuss the channel impairments in underwater acoustic communications and explain how to avoid these impairments.

Question 2: (Answer two points only)   (10 Marks)

a- What is the basic concept of cancelable biometrics? Explain two cancelable biometric systems based on encryption and bio-hashing.

b- Define the PAPR problem in wireless communication systems. Explain how the wavelet transform can be implement in PAPR reduction in multi-carrier communication systems.

c- 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)

a- 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?

b- Explain the steps of iris-based security system. Show how to use sectored random projection to build a secure iris recognition system.

c- Compare between optical OFDM, acoustic OFDM, and wireless OFDM.

Question 4: (Answer two points only)   (10 Marks)

a- Discuss the main differences between traditional network and Software Defined Network (SDN), their architectures, advantages, and disadvantages.

b- Discuss the main differences between NOMA, Single-Carrier NOMA, Multi-Carrier NOMA, Cooperative NOMA, and conventional OMA techniques. Mention their features, benefits, and limitations.

c- Discuss briefly the Visible Light Communication (VLC) system, its advantages, its limitation, and its applications. Compare between the VLC and infrared communication systems.

Question 5: (Answer two points only)   (10 Marks)

a- Discuss the meaning of WiFi offloading, its advantages and disadvantages, and its communication architecture.

b- Explain the operation of molecular communication system. Illustrate its communication model. Compare in detail between the traditional wireless communication systems and the Nano-based molecular communication systems.

c- Compare in detail between SaaS, PaaS, and IaaS cloud computing services. State their merits and characteristics. Mention the case where each one of them makes sense and where each one of them may not be the best option, why?

Question 6: (Answer two points only)   (10 Marks)

a- Compare between Radio Frequency (RF) and Free Space Optics (FSO) communication systems. Draw and discuss briefly the block diagram of FSO system. State the FSO challenges and applications.

b- Explain briefly three different challenges for 3D video communication system. Discuss briefly suggested solutions to mitigate each explained challenge.

c- Define the meaning of Distributed Antenna System (DAS). State the benefits, system components, and applications of DAS system. Compare between active DAS and passive DAS. In your opinion, which one of them is more suitable for the incoming new trends in indoor and outdoor communication system, why?

Question 7: (Answer two points only)   (10 Marks)

a- Mention the main advantages of 5G wireless networks. Compare in detail between the 2G, 3G, 4G, and 5G network architecture. State the main new enabling technologies in 5G networks.

b- Compare between WiFi and LiFi communication systems. State the suggested modulation techniques which can be employed in LiFi system. Mention LiFi system limitations, advantages, and applications. In your opinion, how to integrate between LiFi and WiFi systems?

c- Discuss the objectives of IoT system, its merits, disadvantages, threats, architecture layers, and applications. Explain briefly the IoT generic architecture.

Best Regards
Prof. Fathi E. Abd El-Samie
Dr. Walid El-Shafai