

LOCATION: SWANSEA

LLEOLIAD: ABERTAWE

LEVEL 7

LEFEL 7

EXAMINATION PERIOD
JANUARY 2018

CYFNOD ARHOLIADAU
IONAWR 2018

MODULE CODE: M7X01691
Emerging Network Technologies

TIME: 2 HOURS (USE 1 ½ NOT 1.5 FOR TIME)

ANSWER THREE QUESTION OUT OF FOUR

Equipment or materials required – Basic Calculator

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ANSWER THREE QUESTIONS

Q1.

You have been commissioned to design a “**Smart Garden**” using a Wireless Network (WN) technology of your choice for monitoring the Trinity Garden at the new UWTSD SA1 Waterfront campus.

- a. Design a blueprint network architecture model(s) to conceptualise your design and implementation to address the following:
 - Staff and visitors to the garden should be able to tell what areas are available for use such as seating, grass areas and meeting places.
 - The WN of choice should be linked to the main campus network so that the usability of the garden can be monitored and managed by estates and display screens across the campus.
 - Considerations should be made for monitoring of the air quality, weather conditions and temperature with the use of suitable sensor.
 - The design of the blueprint is up to you, **but you must state all assumptions made and justify your design decisions.**

(20 marks)

- b. Explain how the concepts and principles of computer networks relates to communication systems in terms of the following modulation techniques:
 - Amplitude Shift Keying (ASK)
 - Quadrature Phase Shift Keying (QPSK)
 - Quadrature Amplitude Modulation (QAM)

(5 marks)

Q2.

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people with unique identifiers and the ability to transfer data over a network without requiring human interaction.

- a. Discuss the IoT vision and Future Communication Challenges

(10 Marks)
- b. Identify and explain some security challenges associated with IoT

(15 marks)

Q3.

- a) Describe three types of multiplexing; you should include their advantages and disadvantages.

(9 marks)

b) What is cognitive radio? Describe its architecture and state some of its challenges and issues.

(10 marks)

c) Explain the difference between contention-based and contention-free protocols.

(6 marks)

Q4.

Referring to Long Term Evolution (LTE) and LTE Advanced,

a. Do a comparative analysis of both. Diagrams may be used.

(10 marks)

c. What are some security concerns

(3 marks)

d. Consider figure 2 below with a single high-power transmitter which provides a radio communication service to a city with total bandwidth available is 25MHz and each user requires 40 KHz of bandwidth for voice communication.

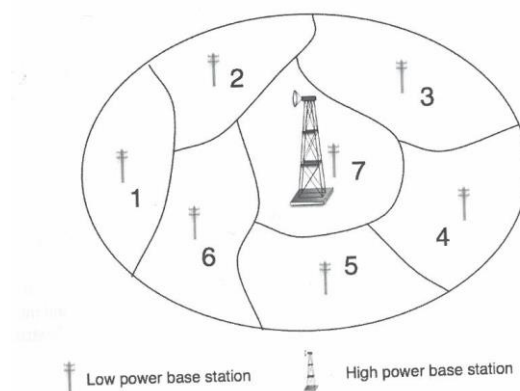


FIGURE 1

i. If one antenna is use to cover the entire town,

1. How many users can be supported simultaneously?

- ii. If the city is split into hexagonal cells with seven cells per cluster
 - 1. How much allocated spectrum each cell has?
 - 2. Hence, how many users can each cell supported?
- iii. If a cellular topology was employed where 20 lower power antennas are opportunistically located to minimize both kinds of interference:
 - 1. Now, what is the total number of simultaneous users?

Note that the number of users supported simultaneously (capacity) can be calculated using the formula: $n = \frac{k(\frac{S}{N})}{W}$ Where S is the total spectrum, W is the bandwidth needed per user, N is the cluster size, and k is the number of cells required to cover a given area.
(12 marks)

Diwedd/End