UNIVERSITY OF SOUTHAMPTON COMP3210W1

SEMESTER 2 EXAMINATIONS 2018/19

ADVANCED COMPUTER NETWORKS

Duration 120 mins (2 hours)

This paper contains 6 questions

Answer **ONE** question from each **Section A, B and C**.

Each Section carries 33% of the total marks for the exam paper.

Total marks: 99

Only University approved calculators may be used.

A foreign language dictionary is permitted ONLY IF it is a paper version of a direct 'Word to Word' translation dictionary AND it contains no notes, additions or annotations.

7 page examination paper

SECTION A

Answer ONE out of the two questions

Question A1

(a) A pollution monitoring sensor system is being designed which can be carried in a backpack or bicycle within a city of 10km diameter. Discuss a networking solution to allow the data to be sent to a server once per day. The sensor data collected is around 6kiB/hour.

Consider the ongoing costs, power requirements and scalability of the system and draw a diagram.

[17 marks]

(b) How could you design the system so that the data was sent every minute as it was collected? Assume a sample rate of 100 Bytes every minute.

[16 marks]

Question A2

a) Compare two published sensor networks – one which uses LoraWAN and another which uses 6LowPAN. Discuss the advantages/disadvantages of each networking approach.

[20 marks]

b) Draw two diagrams representing the two deployments.

[6 marks]

c) Considering one of these two networks, describe an alternative solution for its network.

[7 marks]

TURN OVER

SECTION B

Answer ONE out of the two questions

Question B1

You are the network administrator of a university and are responsible for their network, across campus, halls and other university buildings.

a) The university is currently running on 802.11n Wireless Access Points. As the wireless usage continues to increase and mostly replace wired usage for both students and staff, the current infrastructure is struggling and you are looking to upgrade.

Write a proposal with your suggested upgrade path, what would be required as part of the upgrade and the technical benefits of doing so. Your proposal should include examples highlighting the benefits to the university users, as well as any problems that might be encountered and how they can be mitigated.

[17 marks]

b) Describe the main driving forces behind continuing development in the WiFi space and, with reference to standards currently in development, explain what we are likely to see in the near future. You should comment on their suitability within the university environment.

[16 marks]

Question B2

You are part of a start-up which has launched an incredibly successful space-based MMO, running a single instanced universe.

a) Unfortunately, you have only been able to obtain a single IPv4 adress, but all of the infrastructure needs end-to-end connectivity on the public internet. How could the network be set up to achieve this, and what issues might there be?

[17 marks]

c) Every time a universe update is developed, it needs to be deployed onto all the servers simultaneously, but it is an incredibly large file. Describe a suitable technology that could be used to efficiently make such a deployment, explaining why it would be beneficial and how it would need to be set up.

[16 marks]

TURN OVER

SECTION C

Answer ONE out of the TWO questions

Question C1 WPA2 vs WPA3.

(a) One of the main differences between WPA2 and WPA3 is that WPA3 uses Diffie-Hellman key exchange. Describe the Diffie-Hellman protocol with its phases.
[13 marks]

(b) Describe what WPA2 uses instead of Diffie-Hellman and how it works.
[8 marks]

(c) Describe the security issue of WPA2 and describe the KRACK attack to WPA2. Is WPA3 still vulnerable?
[12 marks]

Question C2

Wireless authentication protocols.

(a) Describe the Simple Client/Server Authentication Protocol. Assuming a key of 16 bit, how many attempts does an attacker need to find the right key? What is an alternative attack to steal the key?

[11 marks]

(b) Describe the Challenge-Response Authentication Protocol. Which security issues does it solve?

[11 marks]

(c) Describe the Man-in-the-Middle attack. Is Challenge-Response protocol vulnerable? Do the attacker need to break the encryption?

[11 marks]

END OF PAPER