Beijing-Dublin International College

SEMESTER I FINAL EXAMINATION - 2017/2018

School of Computer Science
COMP3008J Distributed Systems

HEAD OF SCHOOL NAME: Prof. Pádraig Cunningham

MODULE COORDINATOR NAME*: Dr. Anca D. Jurcut

Time Allowed: 90 minutes

Instructions for Candidates

The distribution of marks in the right margin shown as a percentage gives an indication of the relative importance of each part of the question.

Full marks will be awarded for complete answer to **Question 1** and complete answers **to any TWO other Questions** (Question 2, Question 3, and Question 4).

BJUT Student ID: _____ **UCD Student ID: _____**

I have read and clearly understand the Examination Rules of both Beijing University of Technology and University College Dublin. I am aware of the Punishment for Violating the Rules of Beijing University of Technology and/or University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I accept the punishment thereof.

Honesty Pledge：_____ (Signature)

Instructions for Invigilators

Non-programmable calculators are permitted.
No rough-work paper is to be provided for candidates.

Obtained

score

Question 1: Mandatory

a) Briefly describe the core system architectures that are used in distributed systems.

[5 marks]

b) Briefly describe how *reliable multicast communication* works in a distributed system.

[5 marks]

c) What *is grid computing*? Why is scalability a big issue in the design of Grid Systems?

[5 marks]

d) Explain what is meant by a *digital certificate* and how it is used.

[5 marks]

e) Briefly describe the *ring algorithm* used for voting in a distributed system.

[10 marks]

f) Discuss the *cache - consistency problem*. What are the benefits of using a *cache*?

[5 marks]

g) What is a *distributed file system*? List the main components that make up a distributed file system.

[5 marks]

h) What is a *logical clock*? One way of implementing a logical clock is by using a *Lamport Logical Clock*. Using an example, show how this works.

[10 marks]

[Total 50 marks]

Obtained score

Question 2:

a) Describe and compare the two Remote File Access models, namely the *Upload/Download Model* and the *Remote Access Model*, that are described in the course.

[**7 marks]**

b) What is *mutual exclusion*? Discuss how mutual exclusion may be implemented in distributed systems. Your answer should describe the three approaches discussed in this course, namely: *centralised*, *distributed*, and *token ring*.

[10 marks]

c) Describe the Global Snapshot algorithm for saving state information in a distributed system.

[8 marks]

[Total 25 marks]

Obtained score

Question 3:

a) Describe the *Kerberos* architecture and how this protocol can be used for secure authentication in a distributed system. In your answer discuss the role of the ticket, the authentication token and the session key.

[10 marks]

b) What is cryptography and what it is used for? Briefly describe the two types of cryptographic algorithms.

[10 marks]

c) What are the five methods of attacks regarding distributed systems? Give a relevant example for each method.

[5 marks]

[Total 25 marks]

Obtained score

Question 4:

a) Provide the names of the three types of peer-to-peer File Systems. Give a briefly description and an example of each type.

[7 marks]

b) Briefly discuss Google as a distributed system. In your answer describe the design strategy, at least one of the services provided by Google search engine and outline its system architecture.

[9 marks]

c) Compare and contrast *Routing Overlays* versus *IP Routing*.

[9 marks]

[Total: 25 marks]