Beijing-Dublin International College

SEMESTER I FINAL EXAMINATION - 2017/2018

School of Computer Science & Informatics

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:

a) What is a Distributed System? Give examples of distributed systems.

[5 marks]

b) Explain why it is important to have a *global clock* in a distributed system

[5 marks]

c) Describe and compare a *stateless file service* versus a *stateful file service*. Provide an example of each.

[10 marks]

d) Describe the *Andrew File System*. Explain how this works.

[10 marks]

e) What is a digital signature? How can this be implemented using public key encryption?

[10 marks]

f) Explain the difference between *location transparency* and *location independence.*

[5 marks]

g) What is meant by *replication transparency* and why is it important?

[5 marks]

[Total 50 marks]

Obtained score

Question 2:

a) What is a *replication system*? What are the key components that normally make up a replication system?

[**8 marks]**

b) *Gossip* is an implementation of a replication system. Describe the structure of a gossip *Replica Manager*, including what each part of the manager does.

[10 marks]

c) What are the four coordination techniques presented in this module for replication systems? Give a brief description of each.

[7 marks]

[Total 25 marks]

Obtained score

Question 3:

a) Explain the difference between *symmetric* and *asymmetric encryption.*

[7 marks]

b) Describe in detail the *Network File System*. Explain how this works.

[10 marks]

c) What is peer-to-peer software? Compare and contrast *centralised* versus *decentralised* peer-to-peer systems. Give an example of each type.

[8 marks]

[Total 25 marks]

Obtained score

Question 4:

a) What are the advantages of using a distributed peer-to-peer network such as BitTorrent over previous centralised p2p networks such as Napster? Explain the process by which peers leave and join a BitTorrent network. Include information on the messages and protocols that are used during these processes.

[10 marks]

b) Provide a brief description of one means of calculating physical time. Systems that use physical time can be synchronized using Christian's algorithm or the Berkely algorithm. Outline Christian's algorithm.

[10 marks]

c) Briefly describe the main challenges in a distributed system as discussed in this module.

[5 marks]

[Total: 25 marks]