Beijing-Dublin International College

SEMESTER I FINAL EXAMINATION - 2016/2017

School of Computer Science & Informatics

COMP3008J Distributed Systems

HEAD OF SCHOOL NAME: Prof. Pádraig Cunningham

MODULE COORDINATOR NAME*: Dr. Anca D. Jurcut

Time Allowed: 80 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) What is meant by *replication transparency* and why is it important?

[5 marks]

c) What are the five main types of attack faced by distributed systems? Illustrate each type of attack with a relevant example.

[10 marks]

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

[10 marks]

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

[10 marks]

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

[5 marks]

g) Compare and contrast *active* versus *passive* replication.

[5 marks]

[Total 50 marks]

Obtained score

Question 2:

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

[**5 marks]**

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

[8 marks]

c) Two types of distributed file systems we have looked at are the *Network File System* and the *Andrew File System*. Explain in detail how ONE of these works.

[12 marks]

[Total 25 marks]

Obtained score

Question 3:

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

[10 marks]

b) Describe in detail how *Kerberos* can be used for secure authentication in a distributed system.

[10 marks]

c) What are the key requirements of a computing *grid*? What extensions must be made to basic

web services in order to satisfy these requirements?

[5 marks]

[Total 25 marks]

Obtained score

Question 4:

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

[5 marks]

b) 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]

c) In a distributed system, physical time can be synchronised using Cristian's algorithm or the Berkeley algorithm. Choose ONE of these and explain how it works.

[10 marks]

[Total: 25 marks]