Semester One of Academic Year (2015---2016) of BJUT

《Distributed Systems》

Module Code: COMP3008J

Resit Exam Paper A

Exam Instructions: Question 1 is compulsory. Answer any TWO other Questions

Honesty Pledge:

I have read and clearly understand the Examination Rules of Beijing University of Technology and University College Dublin and am aware of the Punishment for Violating the Rules of Beijing University of Technology and 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 would accept the punishment thereof.

Pledger: _____ **Class No:** _____

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

Notes:

The exam paper has 2 parts on 4 pages, with a full score of 100 points. You are required to use the given Examination Book only.

Instructions for Candidates

Full marks will be awarded for complete answer to **Question 1** and complete answers **to any TWO other Questions** (Question 2, Question 3, Question 4, Question 5).

Instructions for Invigilators

Candidates are allowed to use non-programmable calculators during this examination.

Obtained score

Part 1: Is compulsory

QUESTION 1

QUESTION 1

a) What are *distributed systems*? Give examples of distributed systems.

[5 marks]

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

[5 marks]

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

[5 marks]

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

[5 marks]

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

[5 marks]

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

[5 marks]

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

[5 marks]

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

[5 marks]

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

[5 marks]

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

[5 marks]

[Total 50 marks]

Obtained score

Part 2: Answer any TWO questions

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

[8 marks]

c) Describe in detail the *Andrew File System*. Explain how this works.

[10 marks]

[Total 25 marks]

QUESTION 3

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

[5 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.

[10 marks]

[Total 25 marks]

QUESTION 4

a) 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.

[7 marks]

b) 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.

[8 marks]

c) Describe the Kerberos architecture. In your answer discuss the role of the ticket, the authentication token and the session key.

[10 marks]

[Total 25 marks]

QUESTION 5

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) 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.

[10 marks]

[Total:25 marks]