UNIVERSITY EXAMINATIONS AUGUST 2016

EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER
SCIENCE AND BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY
ICS 2403: DISTRIBUTED SYSTEMS

DATE: DECEMBER 2016   TIME: 2 HOURS
**Instructions: The exam has four questions. Answer <u>Question1</u> and any other <u>2 Questions.</u> Begin
every question on a <u>FRESH</u> page**

Question 1 (Compulsory Question)   (30 Marks)

    a) Why is it not always a good idea of implementing the highest degree of transparency in

        distributed systems?   (1 mark)

    b) What do you understand by the term open system?   (1 mark)

    c) Why is mutual exclusion such an important component in distributed systems? (1 marks)

    d) Using suitable diagrams, discuss three algorithms used for mutual exclusion (9 marks)

        (i) Briefly describe the role of a server and a client in a distributed system.

        (ii) Explain how typical communication is implemented between a server and a

            client   (5 marks)

    e) Explain the role(s) of middleware in distributed systems   (3 marks)

    f) Differentiate between the following   (10marks)

        (i) Distributed operating systems and network operating systems

        (ii) Tightly coupled and loosely coupled systems

        (iii)RMI and RPC

        (iv)Full transparency and partial transparency

        (v) A scalable system and a large system

Question two   (20 Marks)

    a) Discuss replication as a characteristic of distributed systems   (5 marks)

    b) Describe transparency in distributed systems   and discuss any four types of
        transparencies available in distributed systems apart from location transparency
        (9 marks)

    c) Explaining which is easier to identify, troubleshoot and solve, discuss three types of

faults found in a distributed system (6 marks)

Question three (20 Marks)

a) Why is process addressing important in distributed systems? (1 mark)

b) Discuss the following terminology in directory services

    i. Names

    ii. Identifiers

    iii. Addresses (6 marks)

c) Outline how a DNS system works and explain how it ensures location transparency (5 marks)

d) Explain how failures handling is implemented in an IPC model (2 marks)

e) What is the difference between the following

    i. Non-blocking and blocking semantics

    ii. State-full and stateless servers

    iii. Call by value and call by reference (6 marks)

Question four (20 Marks)

a) It is argued that security is a major concern in distributed systems. Describe some of these issues of concern (2 marks)

b) Describe four methods of buffering in message passing (4 marks)

c) What do understand by the following terms

    i. Clock synchronization

    ii. Logical clocks

    iii. Physical clocks (3 marks)

d) Using appropriate diagrams discuss two algorithms used in clock synchronization (6 marks)

e) With reference to distributed systems, explain three ways in how group communication is implemented (3 marks)

f) Why do we use object-oriented models in distributed systems? (2 marks)

Question five (20 Marks)

a) As a distributed system designer, there are several issues of concern related to your design approach that you should consider. Discuss five of these issues. (15marks)

b) Give details of how you would go about dealling with each of the challenges above (5

marks)