

R249/403

DUBLIN INSTITUTE OF TECHNOLOGY
KEVIN STREET, DUBLIN 8.

BSc Information Systems / Information Technology

Stage 4

SUPPLEMENTAL EXAMINATIONS 2008

DISTRIBUTED SYSTEMS

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2 HOURS

ATTEMPT 3 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. (a) Clearly distinguish between *symmetric* and *asymmetric* methods of encryption. **(8 marks)**

(b) Describe clearly the role of the Java sandbox in providing support for security in mobile code environments. **(10 marks)**

(c) Provide a design for a multi-process system whereby messages sent by one process to another can be quickly authenticated to ensure that the message did come from the sender, and not another process masquerading as that sender.

Complete a PMI on the design of your system (i.e. identify the positive, negative and interesting aspects of your design). **(15 marks)**

2. (a) Demonstrate the operation of *garbage collection* in a distributed object system, and provide a brief discussion on the challenges attached to its implementation. **(8 marks)**

(b) Using a simple example, demonstrate how a client-server system could be implemented using either the *Java RMI* or *CORBA* approaches to distributed object systems. You must use sample code in your answer and clearly describe each of the components of the system and their roles. **(10 marks)**

(c) Provide a design for a distributed object system for a *share price service*. Clients should be able to register their interest in a particular share price and should then be informed when the share price changes.

You do not need to provide sample code, but you should use diagrams and you may wish to use pseudocode.

Complete a PMI on the design of your system (i.e. identify the positive, negative and interesting aspects of your design). **(15 marks)**

3. (a) Describe the *two-generals problem*, and discuss clearly what this problem tells us about distributed systems.

(8 marks)

- (b) Clearly identify the various states which a Java thread can occupy. Explain what each of these states mean for the thread, and show how the thread can enter or leave the state.

(10 marks)

- (c) Consider a set of n processes. Design a protocol which the processes could use to determine which process should take on the role of *coordinator*, where the *coordinator* is the first process to request the role.

Complete a PMI on the design of your system (i.e. identify the positive, negative and interesting aspects of your design).

(15 marks)

4. (a) Explain clearly what is meant by the *End-to-End* argument in systems design. Briefly outline your opinion on the argument.

(8 marks)

- (b) It is now well known that the IPv4 address structure will not scale to the future needs of the Internet. Clearly discuss the reasons for this, and describe two efforts to solve this problem.

(10 marks)

- (c) Consider a set of n processes. Each process must be able to send SMS type messages to each other process identifying them by their ID, and containing the sender's ID, the date, the time and the body of the message. Provide a design for a data representation format that could be used, and demonstrate how that data representation format could encode all the parts of the message.

Complete a PMI on the design of your data representation format (i.e. identify the positive, negative and interesting aspects of your design).

(15 marks)