

RW249/403

DUBLIN INSTITUTE OF TECHNOLOGY
KEVIN STREET, DUBLIN 8.

BSc Information Systems / Information Technology

Stage 4

SUPPLEMENTAL EXAMINATIONS 2009

DISTRIBUTED SYSTEMS

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2 HOURS

ATTEMPT 3 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. (a) Provide a definition for the term *distributed system*. Support your answer with reference to some of the key challenges that should be addressed in the design of distributed systems.
(8 marks)
- (b) Briefly contrast *nested transactions* with *flat transactions*, and demonstrate using an example how *locking* is implemented for nested transactions.
(10 marks)
- (c) An algorithm is required to implement *nested transactions* across *multiple servers*. Provide a description of such an algorithm and evaluate it according to its *strengths* and *weaknesses*.
(15 marks)

2. (a) Clearly distinguish between *preemptive* and *non-preemptive* thread scheduling.
(8 marks)
- (b) Identify and describe each of the states that can be occupied by a thread in a Java process, and demonstrate how a thread can enter or leave each state.
(10 marks)
- (c) An algorithm is required to find the highest priority, non-crashed process in a set of processes running on multiple hosts. Provide a description of such an algorithm and evaluate it according to its *strengths* and *weaknesses*.
(15 marks)

3. (a) Explain what is meant by a *secure digest function*, and outline the required properties of such functions.
(8 marks)
- (b) Demonstrate how digital signatures could be implemented using *symmetric encryption methods*, and using *asymmetric encryption methods*.
(10 marks)
- (c) An approach is required to implement secure communication between hosts in a local area network using *symmetric encryption methods* and an *authentication server*. Provide a description of such an approach and evaluate it according to its *strengths* and *weaknesses*.
(15 marks)

4. (a) Describe the *end-to-end* argument in systems design. What does this advise with respect to the design of distributed systems and networking protocols?
(8 marks)
- (b) Clearly describe the operation of the *sliding window protocol* and discuss its importance with respect to networked communication.
(10 marks)
- (c) A protocol is required for communication between processes implementing a distributed whiteboard, whereby users at independent processes can exchange updates to a shared document. Recognising the challenges to the design of such a protocol, propose a design for the protocol and evaluate it according to its *strengths* and *weaknesses*.
(15 marks)