

DUBLIN INSTITUTE OF TECHNOLOGY  
KEVIN STREET DUBLIN 8

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## DT211 BSc. (Honours) Degree in Computing

Year 4

## DT228 BSc. (Honours) Degree in Computer Science

Year 4

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### Supplemental Examinations 2013/2014

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#### Distributed Systems [DT211/4, DT228/4]

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Mr. K. Foley – DT228

Date & Time TBA

Attempt **three** out of **four** questions  
Question 1 carries **34** marks  
All other questions carry **33** marks each

1. (a) We define a distributed system as one in which hardware or software components located at networked computers communicate and coordinate their actions only by passing messages.  
Discuss the *three* consequences of defining a distributed system in this manner?  
(9 marks)
- (b) The ANSA Reference Manual identified eight types of *transparency* in a distributed system.  
(i) Which are the *two* most important transparencies among these? Why?  
(4 marks)  
(ii) Describe and give examples of *four* types of transparency.  
(8 marks)
- (c) Provide Java code to multicast a UDP message from a client to a group.  
(13 marks)
2. (a) Describe the states that a *thread* can be in while running inside a process in a Java Virtual Machine (JVM).  
(8 marks)
- (b) Using an example scenario of your choice, demonstrate how *authenticated* communication can be provided in a *Java implementation* of a standard client server system.  
(12 marks)
- (c) Using sample code and examples, discuss in detail how Java allows programs to run *concurrent threads* of execution, yet still access shared data safely.  
(13 marks)

**3. (a)** Consider the following chat application:

Clients connect to a centralised server. Clients can start a new chat room by supplying the theme (topic) for the room. Other clients can then lookup rooms by their theme. Once clients have either created a room or looked up a room, they can then send a message into the room. Clients can also ask for the contents of the last message sent to the room.

Provide the *interface* code needed for a Java RMI implementation of this application.

**(8 marks)**

**(b)** Explain what is meant by *dynamic class loading* and discuss the advantages of using it for distributed Java RMI applications.

**(12 marks)**

**(c)** Contrast the object model of ordinary local objects and distributed objects under the following headings:

- Object references
- Method invocations
- Garbage collection

**(13 marks)**

**4. (a)** Describe *serial equivalence* in terms of concurrent transactions.

**(8 marks)**

**(b)** With the help of diagrams and examples, show how *nested transactions* differ from *flat transactions*.

**(12 marks)**

**(c)** It is widely felt that *web services* represent the future for middleware and Internet-wide distributed computing. Explain the core technologies of the web service approach, and provide an analysis of its strengths and weaknesses when compared with competing approaches.

**(13 marks)**