R222/416

DUBLIN INSTITUTE OF TECHNOLOGY
KEVIN STREET, DUBLIN 8

BSc Applied Sciences & Computing

Year 4

Supplemental Examinations 2003

Computer Networks and Distributed Systems

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3 ½ hours

Answer <u>FOUR</u> questions, <u>TWO</u> from each section.

All questions carry equal marks

Section A

1. (a) Discuss *why* it is important that the Java language/environment should have sophisticated mechanisms for handling security.

(5 marks)

(b) Discuss in detail how Java manages security.

(11 marks)

(c) Explain the requirement for, and the operation of *SSL* (the *Secure Sockets Layer*).

(9 marks)

2 (a) Using sample code where necessary, explain what is meant by the term *serialisation*, in relation to Java objects.

(3 marks)

(b) Using sample code, show how to create a simple TCP server that will receive a Java object of type `Person`, where the `Person` class has `name` and `address` attributes, both of which are `java.lang.String`s.

(7 marks)

(c) Provide the code for the TCP client that would send the object in part (b) above.

(3 marks)

(d) List and describe the seven layers of the OSI protocol stack.

(4 marks)

(e) "In developing an application layer protocol, one of the most important decisions to make is which protocol to build on top of."

Discuss this statement in reference to at least *three protocols* upon which application layer protocols have been built.

(8 marks)

3. (a) Discuss what is meant by the term *transparency* in a distributed system. In your answer you should provide examples of five different types of transparency, and discuss, for each one, how it is supported in Java (whether standard APIs, Jini, EJB or other tools).

(13 marks)

(b) Using sample code and examples, discuss in detail how Java allows programs to run in concurrent threads of execution, yet still access shared data safely.

(12 marks)

4. (a) Explain in detail the function of the *Internet Protocol* (IP).

(7 marks)

(b) "One fundamental problem with IP is addressed separately by CIDR and IPv6."

Discuss what this problem is, and explain in detail how it is handled by both CIDR and IPv6.

(10 marks)

(c) Using diagrams, clearly explain the operation of *Mobile IP*.

(8 marks)

Section B

5. (a) How does a Java *interface* differ from a Java *class*?

(2 marks)

(b) What is meant by the term *reflection*, when used in the context of Java objects? Use an example in your answer.

(3 marks)

(c) Describe in detail what is meant by the term *Remote Method Invocation* (RMI), and how precisely it differs from invocation of local methods.

In your answer you should list and explain all the main issues that makes RMI different to normal invocation of local methods. You should use comprehensive examples and diagrams. You may use Java RMI terminology to help illustrate your answer.

(14 marks)

(d) What is meant by a *client callback* in terms of a distributed object system? In your answer you should explain how such a facility could be implemented using Java RMI.

(6 marks)

6. (a) Discuss *Enterprise Java Beans (EJB)* in detail, explaining why an application developer would choose to use EJB instead of ordinary Java objects and tools.

(11 marks)

(b) Describe three ways in which it is possible to create a *transaction* for an EJB. Compare and contrast each mechanism.

(7 marks)

(c) Describe the p*hantom problem*, the *unrepeatable read problem* and the *dirty read problem* in terms of the *isolation* property of transactions.

(7 marks)

7. (a) Discuss in detail *distributed event based systems*, such as those implemented using Jini.

(9 marks)

(b) What is meant by the term *garbage collection*, in the context of an object oriented environment?

(2 marks)

(c) Explain how Java implements garbage collection, and how this impacts upon the programmer who develops Java classes.

(3 marks)

(d) Describe why garbage collection is difficult in a distributed system, as opposed to a localised system.

(5 marks)

(e) Describe the *reference counting* algorithm for *distributed garbage collection*.

(6 marks)

8. (a) Compare and contrast *CORBA* with Java RMI.

(8 marks)

(b) Compare and contrast *web services* with Java RMI.

(8 marks)

(c) What is meant by the term *semantic web*?

(3 marks)

(d) "The semantic web could greatly assist in the development of composite web services".
Discuss.

(6 marks)