

S249/316A

DUBLIN INSTITUTE OF TECHNOLOGY
KEVIN STREET, DUBLIN 8.

BSc Information Systems / Information Technology

Stage 3

SUMMER EXAMINATIONS 2007

DISTRIBUTED INFORMATION SYSTEMS

MR. C. O'LEARY
DR. B. O'SHEA
MR. P. LAWLESS

22ND MAY 2007, 14:00 – 17:00

ATTEMPT 4 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

- 1 (a) Identify and discuss *three* important features of distributed systems. **(6 marks)**
- (b) Clearly explain the *End-to-End* argument in system design, and demonstrate its relevance (or irrelevance) as you see it to modern networked communication. **(9 marks)**
- (c) Provide a design for an application layer protocol for an *instant messaging system*. You must describe how your protocol interfaces with lower layer protocols and provide the full set of messages that are exchanged between the principals in the system. What are the key concerns for the system designers? **(10 marks)**
- 2 (a) Present an argument for or against the dependence of a distributed system on a shared understanding of *time*. **(6 marks)**
- (b) Outline the operation of the *network time protocol*. Outline the strengths and weaknesses of the protocol as you see them, and suggest modifications which may address the weaknesses. **(9 marks)**
- (c) Provide a design for an algorithm to ensure *mutually exclusive, safe, live* and *totally ordered* access to a shared resource. **(10 marks)**
- 3 (a) What is necessary to ensure that two concurrent transactions are *serially equivalent*? **(6 marks)**
- (b) Define *two-phase locking* and *strict two-phase locking* as they apply to transactions. Clearly justify the requirement for strict two-phase locking. Use examples where necessary. **(9 marks)**
- (c) Demonstrate clearly how conflict between concurrent transactions can be managed without employing locking. Present an argument for or against the employment of this / these method(s). **(10 marks)**
- 4 (a) Describe the role of the *proxy objects* in a distributed object system. **(6 marks)**
- (b) Provide all the Java classes and code necessary for a system that instantiates and binds a simple remote object with one method. **(9 marks)**
- (c) Clearly demonstrate the important differences between the passing of primitive types (int, float etc), objects and remote objects as parameters to remote methods. **(10 marks)**

- 5 (a) What is meant by the *publish-subscribe* interaction pattern for distributed objects? Use examples to illustrate your answer. **(6 marks)**
- (b) Describe the importance of the filtering algorithm in distributed event based systems. Clearly distinguish between the main classes of filtering algorithms. **(9 marks)**
- (c) Provide a filtering algorithm for a *blog* or *discussion board* which operates with all the standard functionality of an event-based system. **(10 marks)**
- 6 (a) Briefly explain the terms *well-formedness* and *validity* as it applies to XML languages and documents. **(6 marks)**
- (b) Identify and discuss the key characteristics of a *service-oriented architecture*. **(9 marks)**
- (c) Present your view on the future evolution of the World-Wide-Web. You must refer in your discussion to the following:
- Web Services
 - Web 2.0
 - Semantic Web
- (10 marks)**