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DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION SYSTEMS
COLLEGE OF INFORMATICS AND ELECTRONICS
Assessment Paper

MODULE CODE:	CS4226	**MODULE TITLE**:	Distributed Systems
TERM:	Semester 2, 2007/8	**EXAM DURATION:**	2.5 hours
LECTURER:	Chris Exton	**VALUE OF EXAM:**	60%

INSTRUCTIONS TO CANDIDATES:
Answer all questions. Each question is worth 20%.

Question 1. (20 marks)

Some distributed systems use logical clocks as suggested by Lamport.

a) Explain how happened-before ordering can be achieved using Lamport's logical clocks.
b) What is the difference between a real clock and a logical clock?
c) What are logical clocks used for?
d) Why can't real clocks always be used instead?

Question 2. (20 marks)

a) Discuss (in summary form) the main key management problems in cryptography. (4 Marks)
b) Give the generic form of the algorithms used in symmetric (secret key) and asymmetric (public key) cryptography. Briefly describe them. Notation to be used: Message M, key K, published encryption functions E, D. (8 Marks)
c) Explain the concept of authenticated communication with public keys. In your answer, illustrate your explanation with a scenario where Alice and Bob establish such a connection. (8 Marks)

Question 3. (20 marks)

a) Briefly summarize the functionality of the Host Controller Interface (HCI), Logical Link Control and Adaptation Protocol (L2CAP) and the RFCOMM in Bluetooth technology. (4 Marks)
b) Explain how a Bluetooth device *searches* and *browses* for services using the Service Discovery Protocol. In your answer, define the terms *search* and *browse* in this context. (8 Marks)
c) When does a Bluetooth device operating in security mode 2, start to initiate any security procedures? (8 Marks)

Question 4. (20 marks)

a) What is the formula for Amdahl's Law?
b) If 90% of a calculation can be parallelized what is the theoretical maximum speed-up which can be achieved on a 5 processor system?
c) Discuss Amdhal's law in relation to Moore's law and what both have to say in terms of the future of software development.

Question 5. (20 marks)

a) Name and describe the four necessary conditions for deadlock to occur.
b) Explain the three main design strategies that yield safe objects.
c) A Thread scheduler may be pre-emptive or non pre-emptive, what does this mean?