INSTITUTE OF TECHNOLOGY BLANCHARDSTOWN

Year	Year 3
Semester	2
Date of Examination	Friday 18th May 2012
Time of Examination	9:30am to 11:30am

Programme Title	Bachelor of Science in Computing in Information Technology
Programme Code	BN302
Module Title	Network Distributed Computing
Banner Module Code	COMP H3031

Programme Title	Bachelor of Science in Computing in Information Technology
Programme Code	BN013
Module Title	Network Distributed Computing
Banner Module Code	COMP H3031

Programme Title	Bachelor of Science (honors) in Computing
Programme Code	BN104
Module Title	Network Distributed Computing
Banner Module Code	COMP H3031

Internal Examiner(s):   *Dr. Anthony Keane*

External Examiner(s):   *Dr. Richard Studdert*
Mr. Michael Barrett

Instructions to candidates:

1) To ensure that you take the correct examination, please check that the module and programme which you are following is listed in the tables above.

2) **Answer question 1 and _any two_ of the other questions.**

3) Question 1 is worth 40 marks and all other questions are worth 30 marks each.

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Question 1:   **Total 40 marks**

(a)   How does Distributed Applications use *message passing* to exchange data and illustrate your answer with some examples?

(8 marks)

(b)   Briefly describe the following characteristics of distributed systems and give some examples of why they are important in modern enterprise applications:
- Scalability
- Transparency

(8 marks)

(c)   In the following examples, briefly explain how *openness* and *failure handling* would be important to the successful operation of the application:
- Electronic Mail
- Web services

(8 marks)

(d)   What are the primary challenges with using *Multimedia Applications* as a component in a distributed application?

(8 marks)

(e)   Assuming two computer clocks on a network have the same max drift rate ρ where $1-\rho \leq dC/dt \leq 1+\rho$. To keep them synchronized to within a time interval delta, δ, show that they must re-synchronize every $\delta/2\rho$ seconds.

(8 marks)

Question 2:   **Worth 30 marks**

(a)   In each case, give two examples of client-server and peer-to-peer computer
       systems.

                                                                      (6 marks)

(b)   Describe Client-Server distributed applications and outline any advantages or
       disadvantages to using client-server systems.

                                                                     (12 marks)

(c)   Describe Peer-to-Peer distributed applications and outline any advantages or
       disadvantages to using Peer-to-Peer systems.

                                                                     (12 marks)

Question 3:   **Worth 30 marks**

(a)   What are the main differences in developing distributed applications for
       mobile wireless systems compared to traditional wired computer systems.

                                                                      (8 marks)

(b)   What are the main concerns for organizations in using wireless applications
       and give some examples.

                                                                     (10 marks)

(c)   Describe the steps in creating a Java application designed to run on a mobile
       device and in your answer explain any terms used, like CLDC and MIDP.

                                                                     (12 marks)

(a)   What are the epochs used with computer systems and identify any issues for distributed applications when using *time clocks* on a computer to tell time?

(6 marks)

(b)   Identify the terms in the following equation and explain how it is used to describe a software clock that approximates real physical time for a process.

$$C_i(t) = \alpha H_i(t) + \beta$$

(8 marks)

(c)   Describe *any method* for synchronizing clocks on an asynchronous system, like the Internet.

(10 marks)

(d)   A client attempts to synchronise with a time server. It records the round-trip times and timestamps returned by the server in the table below.

(i)   Which of these times should it use to set its clock?

(ii)   To what time should it set it?

(iii)   Estimate the accuracy of the setting with respect to the server's clock.

Round-trip(ms)	Time (hr:min:sec)
12	11:02:45.123
15	11:04:24.456
11	11:06:38.789

(6 marks)