

Ollscoil na hÉireann, Gaillimh
National University of Ireland, Galway
Semester II Examinations 2006/ 2007

Exam Code(s)	1IF 1
Exam(s)	B.Sc. in Information Technology
Module Code(s)	CT108
Module(s)	Next Generation Technologies I
Paper No.	1
Repeat Paper	
External Examiner(s)	Prof. John Keane
Internal Examiner(s)	Prof. Gerald Lyons Dr. John Breslin, Dr. Conn Mulvihill, Dr. Aaron Golden, Dr. Michael Schukat

Instructions: Answer questions from all 4 sections.
Use separate answer books for each section.
Answer **one** question within each section.
All questions carry equal marks.

Duration	3 hours
No. of Pages	6
Department(s)	Information Technology
Course Co-ordinator(s)	

Requirements:
MCQ
Handout
Statistical Tables
Graph Paper
Log Graph Paper
Other Material

Question 1

- a) Give the HTML code that would be required to produce Table 1.

Year	Product	Budget
2001	Fruit	€15M
2002	Fruit	€20M
2003	Apples	€12.5M
	Oranges	€13.5M
Grand Total		€61M

Table 1

10 MARKS

- b) Some popular examples of sites offering “Web 2.0” functionality are *del.icio.us* and *Flickr*. Detail some of the features of these sites, and give an example of how a Web 2.0 community site could be created to aid people in finding popular restaurants in Galway.

7 MARKS

- c) Distinguish between the Internet, the World Wide Web, and the Semantic Web.

3 MARKS

Question 2

- a) Describe some of the main features of blog sites. Explain what RSS is and give some examples of what RSS can be used for.

8 MARKS

- b) What are the advantages and disadvantages of using a wiki to produce a web page or set of web pages as opposed to creating a set of static HTML pages?

4 MARKS

- c) What is an “ontology” used for on the Semantic Web? Show, with the aid of an example, how an ontology could be used to augment metadata information about a sports team of your choice and the people involved in that team.

8 MARKS

Question 3

a) What do you understand by a 'computer game'?

5 MARKS

b) Consider a machine that accepts payment for parking. It gives no change. It accepts 20, 40, and 50 cent coins only from the local currency. If the cost of your parking is 80 cent, show the different ways that the amount to be paid can be accepted by the machine.

10 MARKS

c) Would the type of machine in (b) be of any use in modeling behavior in games in your view?

5 MARKS

Question 4

a) Consider the following maze and obstacles, where an obstacle is given by an uppercase letter placed in a cell:

		A	N				
			A				
☺			S				food
			T				
		W	Y				
						L	
						L	
						A	
						W	
	W	A	L			A	

The smiley located at the left of the maze wants to get to the food at the right. The smiley may move as follows.

Specific rule for movement:

- 1 Walk one cell at a time.
- 2 Walk east. If blocked, walk north. If blocked, walk west. If blocked walk south. If blocked go back to beginning of rule 2 and walk east again.

Suggest what happens to the smiley walking through the above maze, explaining what the above rule means to you in the course of your answer.

10 MARKS

b) Could you suggest any general search technique that might apply to this kind of situation so that the smiley can in fact get to the food?

10 MARKS

Question 5

Given the following first order differential equation:

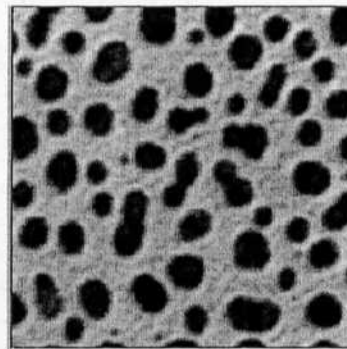
$$\frac{dI}{dx} = -kI(x)$$

Show how one can solve for $I(x)$ using both analytical and numerical techniques, specifically Euler's Method. Illustrate how numerical error is associated with the latter, and show how employing the Runge-Kutta formalism can limit this significantly.

20 MARKS

Question 6

The following is a 16-bit 512x512 pixel grey scale image taken by a microscope of human cells that need to be examined by a specialist to identify unusual morphologies consistent with a specific disease.



What is meant by the term '16-bit 512x512 pixel grey scale', and what does it imply as regards the dynamic range of the image?

Can you describe an automatic way whereby a computer program could estimate the total number of cells in this image?

Say the specialist's clinic has 250,000 patients, with each patient being assessed once a year, with each assessment resulting in 10 of the above images. What is the typical total annual storage requirement for this image data? Discuss the feasibility and viability of compressing these images – in your answer outline specific compression techniques relevant to your discussion.

20 MARKS

Question 7

a) What do you understand by the term *medical informatics*?

5 MARKS

b) Discuss in some detail how biomedical devices and medical imaging can help to diagnose and treat heart conditions.

15 MARKS

Question 8

a) Outline and assess the strengths and weaknesses of traditional (paper-based) medical record systems. Use examples to illustrate your arguments?

10 MARKS

b) Describe **three** important imaging technologies and outline in which diagnostic/therapeutic context they are being used.

10 MARKS