INSTITUTE OF TECHNOLOGY BLANCHARDSTOWN

Year	Year 2
Semester	Semester 2
Date of Examination	Tuesday 24th May 2011
Time of Examination	12.30pm – 2.30pm

Prog Code	BN002	Prog Title	Higher Certificate in Science in Computing in Information Technology	Module Code	COMP H2031
Prog Code	BN013	Prog Title	B.Sc. in Computing in Information Technology	Module Code	COMP H2031
Prog Code	BN104	Prog Title	B.Sc. (Honours) in Computing	Module Code	COMP H2031

Module Title	Object Oriented Analysis and Design

Internal Examiner(s): *Frances Murphy*
External Examiner(s): *Mr. John Dunnion, Dr. Richard Studdert*

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) This paper contains 4 questions.

3) You are required to answer 3 questions (Question 1 and any 2 other questions of your choice).

4) Question 1 is compulsory and is worth 40 marks.

5) All other questions are worth 30 marks.

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PART A – Compulsory Question

Question 1

This question is divided in to 12 parts, (i) to (xii). Answer **any 10 of the 12** parts. Each part is worth 4 marks.

(i)	Explain the difference between an **actor** and a **use case**.
(ii)	Explain, and give an example of, an <<**include**>> relationship, in a use case diagram.
(iii)	What is the difference between an **object** and a **class** in an object oriented system?
(iv)	Distinguish between the terms **abstract class** and **concrete class.** Illustrate your answer by means of a class diagram.
(v)	Illustrate the following using a **class diagram**: • An organization employs many employees, including sales managers and sales personnel.
(vi)	Give an example of a **generalization.** Your example should include at least **three** subclasses and **one** operation for each class.

(vii)	Draw an **activity diagram** to capture the following series of events:
	• Three days before the flight, my travel agent emails me with a list of required travel documents.
	• If the list is not received by the three day deadline, I cancel the flight.
	• Otherwise:
	  • Three hours before the flight, I order a taxi.
	  • When the taxi arrives, I leave for the airport.

(viii)	Identify, and explain, each of the components in the following call message taken from a sequence diagram: *[lpassportOK]processPayment(String name)* ⟶
(ix)	Describe what a **Use Case Specification** is. State when and how it is used in the software development life cycle.
(x)	Draw a **use case diagram** to illustrate the scenario described below. • A student prepares for their exams by studying the lecture notes. • In order to cover the course fully, he must also read texts from the library. • Due to unforeseen circumstances e.g. illness, a student may not be able to prepare for their exams. **Question 1 continued overleaf**

Question 1 continued	
(xi)	A proposed **Product** class has the following instance variables: *productId:Integer* *productName: String* Write out the *getter* and *setter* methods for these instance variables.
(xii)	A proposed **Account** class has the following instance variables: *accountNo: String* *accountName: String* *interestRate: Double* Assume **two** constructors have been declared in the class, one being the **default constructor** and the other a **user-defined** constructor which took three parameters. Write Java code to demonstrate how objects could be instantiated by each constructor.
	Total (40 marks)

PLEASE TURN OVER FOR PART B

PART B - Answer any 2 questions of your choice.

Question 2

(a)	Describe the **four** phases of the **RUP** approach to software development.	**(10 marks)**
(b)	List **4 reasons** why 80% of software projects fail or are never delivered.	**(4 marks)**
(c)	State **6 reasons** why developing UML models of a software system aid the development of better quality software.	**(6 marks)**
(d)	Represent the following scenario in **two** ways, as a: **(1) Sequence Diagram,** and a **(2) Collaboration Diagram** • A user puts bread into the toaster and moves it down with the slider. • This is the signal for the electric heater is be switched on. • An internal timer is then set for toasting the bread. • When the heating time has elapsed, the heater is turned off and the toast pops out of the toaster.	**(10 marks)**
		Total (30 marks)

Part B - Question 3

(a)	Consider the following scenario: *musicNow* is a digital music company that operates entirely on the web. • Customers browse the catalogue for songs they want, add them to their basket, and proceed to a secure checkout area. • The checkout process involves, for first time users, registering their username, password, delivery address, and credit card details. • For subsequent visits, this information can be retrieved using the original username and password. • Once a customer's payment has been accepted, the music files purchased become available to download from the user's on-line account for a period of 7 days. • Items are charged to the customer on a per-song basis; a database of current prices is maintained by the company with price changes made at the request of the record companies (suppliers). • A large number of record companies provide songs for *musicNow*. • Each record company has an individual contract with *musicNow*, stating the commission they will earn for each song sold on the web site. Draw a **use-case** diagram to show the roles of **<u>two</u>** actors only: *customer* and *record company*.	**(15 marks)**
(b)	Consider the following library system: • A library has books, videos and cds which it loans to its library members. • All library material has a unique id number and title. In addition, books have one or more authors, videos have one producer and one or more actors, while cds have one or more artists. • The library holds one or more copies of each library item (book, video or cd). • Copies of all library material can be loaned to library members. Reference-only material is loaned for two hours only. • Other material can be loaned for two weeks. • For every loan, the library records the library member's name, the loan date and time, and the return date and time. • For members, the library records their name, address and phone number. Draw a **class diagram** for the description above. Make sure to show attributes, multiplicities, and inheritance / aggregation / composition, where appropriate. There is no need to show any operations.	**(15 marks)**
		Total (30 marks)

Part B - Question 4

(a)	Draw a **sequence diagram** to represent the following scenario: A student can perform a math test on a website. • The student begins by logging in (assume they have previously registered). • Each question is presented on the screen, one question at a time. • The student answers each question and the system checks if the question has been answered correctly. • The student is informed of the correct answer before continuing on to the next question. • The system keeps a running score of each correct answer and at the end of the test, the student is shown their score. • At that stage, they can choose to continue to the next test in the series or they can retake the current test.	**(8 marks)**
(b)	Draw a **state chart diagram** that specifies the following dialogue structure for a login session. • The session begins when a user clicks on a login button. • Then the session prompts the user for their username and password, checks that the user has authorisation and then logs them in. • If there is problem with the username or password, the user is given one more chance to input a valid username and password, otherwise the program goes into a 10-minute time-out and then returns to idle mode. • While the user is logged in, he is allowed to run particular programs by clicking on appropriate buttons. • When the user clicks the "log out" button, the session terminates.	**(10 marks)**
(c)	Draw a partitioned **activity diagram,** which includes **swimlanes,** of the following warehousing system: • Orders are received in the Ordering Department and items on the orders are checked for availability. • If all items are available, the order is passed to the Picking Department for picking the physical items from the shelves and then onto the Dispatch Department from which a despatch note will be generated. • If some items are not available, then the order goes back to the Ordering Department until the missing items are delivered. Then it is passed onwards, as described above. • If a missing items is delayed in coming in, the customer may cancel the order. • When the order is finally delivered, the Ordering Department is informed so that the order can be closed.	**(12 marks)**
		Total (30 marks)