# INSTITUTE OF TECHNOLOGY BLANCHARDSTOWN

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| Year | Year 2 |
| Semester | Semester 1 |
| Date of Examination | Monday 16 January 2012 |
| Time of Examination | 9.30am – 11.30am |

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| 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 |

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| **Module Title** | **Object Oriented Analysis and Design** |

**Internal Examiner(s):** *Frances Murphy*
**External Examiner(s):** *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

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| 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**:<br>• A customer can have any number of bank accounts and a bank account can be held by one person or two people (a "joint account").<br>• A bank account must either be a current account or a savings account. |
| (vi) | Give an example of a **generalization.** Your example should include at least **three** subclasses and **one** operation for each class. |
| (vii) | Write Java code samples to illustrate the following concepts:<br>• Inheritance<br>• Method overloading |
| (viii) | Represent the following statement as a call message in a sequence diagram:<br>• If the alarm rings, contact the police with your contact details and message. |
| (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.<br>• A distance runner prepares for races by training on the road, track or gym regularly.<br>• In order to prepare fully, he must also watch his diet.<br>• Due to unforeseen circumstances e.g. injury, a runner may not be able to prepare fully for a race.<br><br>**Question 1 continued overleaf** |

| **Question 1 continued** | |
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| (xi) | A proposed **Animal** class has the following instance variables:<br>*animalId:Integer*<br>*animalName: String*<br><br>Write *getter* and *setter* methods for these instance variables. |
| (xii) | A proposed **House** class has the following instance variables:<br>*houseId: String*<br>*Address: String*<br>*rent: Double*<br><br>Assume **two** constructors have been declared in the class, one being the **default constructor** and the other a **user-defined** constructor, which takes **three** parameters, write Java code to demonstrate how objects can be instantiated **for each** constructor. |
| | **Total (40 marks)** |

**PLEASE TURN OVER FOR PART B**

## PART B - Answer any 2 questions of your choice.

### Question 2

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| (a) | Describe the **four** phases in the **Rational Unified Process (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) | Name each section in a **Use Case Specification Document** and describe its main purpose (one sentence each). | **(10 marks)** |
| | | **Total (30 marks)** |

**PART B continued overleaf**

## Part B - Question 3

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| (a) | Represent the following requirements for a point-of-sale system, as a **use case** diagram:<br><br>• The system allows the administrator to run stock reports by loading stock data.<br>• The administrator can update the stock by loading and saving the stock data.<br>• A sales clerk records sales made on the shop floor.<br>• A tele-sales agent is a special kind of sales clerk who handles tele-sales.<br>• Any kind of sale can update the stock.<br>• A sale may need to be verified, if purchased by credit card or by cheque.<br>• All staff must log in to the system at the start of the day and log out at the end of the day, or when they take breaks.<br>• The log-on process authenticates the user to the system.<br>• The manager is responsible for registering staff with the system and removing them when they leave the organisation.<br>• Only registered users can log on to the system. | **(15 marks)** |
| (b) | Draw a UML class diagram representing the following scenario:<br>Make sure to show *attributes, multiplicities and inheritance / aggregation /composition* symbols, where appropriate.<br><br>• A hockey league is made up of at least 4 hockey teams.<br>• Each hockey team is composed of 6 to 12 players, and one player captains the team.<br>• A team has a name and a record.<br>• Players have a number and a position.<br>• Hockey teams play games against one another.<br>• Each game has a score and a location.<br>• Teams are sometimes led by a coach.<br>• A coach has a qualification and a number of years of experience, and can coach multiple teams.<br>• Coaches and players are people, and people have names and address. | **(15 marks)** |
| | | **Total (30 marks)** |

## Part B - Question 4

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| (a) | Draw a **sequence diagram** to represent the following use case description of a cardholder withdrawing money from an ATM machine.<br><br>• A cardholder selects the "withdrawal" option.<br>• The ATM machine displays the withdrawal options.<br>• The cardholder specifies the amount they wish to withdraw.<br>• The ATM machine checks the cardholder has sufficient funds.<br>• The ATM machine ejects the card.<br>• The ATM machine prompts the cardholder to take their card.<br>• The cardholder takes their card.<br>• The ATM machine dispenses the amount requested.<br>• The ATM machine prompts the cardholder to take their cash.<br>• The cardholder takes their cash.<br>• The ATM machine debits the cardholder's account.<br>• The ATM machine thanks the cardholder.<br>• The ATM machine displays a welcome message and awaits the next cardholder. | **(10 marks)** |
| (b) | Draw a **state chart diagram** for the following system, which describes a flight check-in /boarding process:<br><br>• After a passenger checks for a flight, he/she joins a line to get through the security checkpoint.<br>• Then, he/she goes through the security check.<br>• If there are any problems, he/she has to go through the security check again, until everything clears.<br>• The passenger will go to the boarding gate and wait for boarding.<br>• When boarding is announced, he/she will board the plane.<br>• In certain circumstances, the flight may be cancelled. In this case, the passenger will need to check in for a new flight at the gate.<br>• If there is no later plane or there are no seats available, the passenger will leave the airport.<br>• After all the passengers board the plane, the plane will take off.<br><br>**Question 4 Part (c ) overleaf** | **(10 marks)** |

| **Part B - Question 4 cont.** | | |
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| (c) | Draw an activity diagram for the following scenario, which describes the business process involved in publishing an academic paper:<br><br>• The author submits a paper to an editor of a journal.<br>• The editor first checks whether the paper fits the theme of the journal.<br>• If not, the editor rejects the paper and informs the author of the fact.<br>•<br>• Otherwise, the editor assigns the paper to a number of reviewers.<br>• The reviewers review the paper and write a review.<br>• The review is sent to the editor.<br>• The editor then assesses the quality of the paper with the help of the reviewer's comments.<br>• If the quality is good, the paper will be accepted, the author will be notified and the paper will be sent to the publisher for publication.<br>• If the quality is not up to standard, the editor rejects the paper and informs the author. | **(10 marks)** |
| | | **Total (30 marks)** |