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| Year | Year 2 |
| Semester | Semester 2 |
| Date of Examination | Tuesday 24th August 2010 |
| Time of Examination | 10.00am - 12.00pm |

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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 |
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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.

DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO

PART A – Compulsory Question

Question 1

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| This question is divided in to 12 parts, (i) to (xii). Answer <u>any 10 of the 12</u> parts. Each part is worth 4 marks. | |
| (i) | Explain the difference between the “ main success scenario ” or “ primary ” path and the “ alternate ” path in a use case. |
| (ii) | Explain, and give an example of, an << include >> relationship, in a use case diagram. |
| (iii) | What is the difference between a class and an object in an object oriented system? Use examples to illustrate your answers. |
| (iv) | Explain the concept of inheritance , with respect to object oriented programming. Illustrate your answer by means of a <i>code sample</i> . |
| (v) | <p>Illustrate the following relationships using a class diagram. Your diagram should include <i>labeled association names</i> and <i>multiplicity</i>.</p> <ul style="list-style-type: none"> • A CD consists of a song collection. • A song collection consists of 1 or more songs. • A song may appear on a song collection. |
| (vi) | Give an example of aggregation . Your example should include <u>one</u> aggregation object and <u>three</u> component objects. Specify the <i>multiplicities</i> at the end of all the aggregation relationships. |
| (vii) | Distinguish between a fork and a join in an activity diagram. Show how each is represented in a diagram. |
| (viii) | <p>In a statechart diagram, a transition label may consist of three elements. Identify the three elements in the following label and explain what the label means.</p> <p style="text-align: center;"><i>Register[num_students < 20]/process documentation</i></p> |
| <p style="text-align: center;">PART A: Compulsory - Question 1 continued overleaf</p> | |

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| | PART A : Compulsory - Question 1 continued |
| (ix) | <p>Draw a state chart diagram of a pre-timed traffic light system described as follows:</p> <ul style="list-style-type: none"> • The lights display a sequence of green, amber and red lights continuously. • Each light is displayed for 90 seconds. |
| (x) | <p>Explain the term swim lanes, with respect to an activity diagram, and explain their purpose. Use an example to illustrate your answer.</p> |
| (xi) | <p>Distinguish between the terms abstract class and concrete class. Illustrate your answer by means of an example and class diagram.</p> |
| (xii) | <p>Explain the difference between an actor and a use case.</p> |

Total (40 marks)

PLEASE TURN OVER FOR QUESTIONS 2, 3 AND 4.

PART B - Answer any 2 questions of your choice.

Question 2

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| (a) | Describe, with the aid of a labeled diagram, the prototyping approach to software development. | (4 marks) |
| (b) | Describe, with the aid of a labeled diagram, the main features of the Spiral Model of software development. | (8 marks) |
| (c) | Describe the <u>four</u> phases of the RUP approach to software development. | (8 marks) |
| (d) | UML splits the modeling of a software system into <u>five</u> main views. Name the <u>five</u> views and write an account of <u>two</u> of the views, describing: <ul style="list-style-type: none">• what the view does• what the view focuses on, <i>and</i>• who the view is of interest to. | (10 marks) |

Total (30 marks)

PLEASE TURN OVER FOR QUESTIONS 3 AND 4.

Question 3

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| (a) | <p>Draw a use case diagram for a <i>Felix Pets Ltd.</i>, a veterinary surgery practice, which caters for domestic animals, described as follows:</p> <p>Most owners make an appointment with the receptionist before they turn up. When an owner takes their pet to the surgery, they first have to register their animal to be seen by one of the vets on duty. The receptionist asks for the owner's name and the name of their pet, so their details can be searched on the system. If the owner is new to the surgery, or an existing owner has a new pet, their details have to be added to the system.</p> <p>Once the pets are registered, they are then allocated to one of the vets on duty and the owner waits for their consultation. When the vet is ready, the vet first has to look up the details of the owner and pet on the system.</p> <p>After the vet treats the animal, they will write up their notes on the system, detailing any problems and the treatment given. If any further treatment is needed, the vet will produce a list of medication for the receptionist to dispense. The receptionist will then produce an invoice for the owner to pay.</p> <p>Some pets will have annual injections, for example, for flu jabs. Once a week the receptionist will produce a list of reminder letters to send out to owners, reminding them their pet's booster is due.</p> | (15 marks) |
| (b) | <p>Draw a class diagram, showing the relevant <i>classes, operations, associations and multiplicities</i> for the following scenario.</p> <p>An online community shares D.I.Y. tips.</p> <ul style="list-style-type: none">• The community consists of an administrator and a number of members.• There are two types of members; regular members and contributors.• A contributor actively writes tips, while regular members read tips posted.• A regular member can write a comment on a tip he/she reads.• The contributors can make use of these comments for improvements to their tips.• The contributors are registered and issued with passwords by the administrator. They must logon to post tips.• The administrator removes the old tips when space runs short. | (15 marks) |

Total (30 marks)

PLEASE TURN OVER FOR QUESTION 4.

Question 4

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| (a) | <p>Draw an Activity Diagram to illustrate the following scenario:</p> <p>A customer can buy books by calling the Sales Department of <i>XYZ Book Shop</i> by phone and providing Sales with order details.</p> <ul style="list-style-type: none"> Once Sales receive the order, a clerk will check for the membership status of the customer. If a customer's membership is still valid, Sales will enter the order details, as given by the customer. Sales will then pack the items, await for shipment and, at the same time, create an invoice which they will send out. If Sales has received a cheque from the customer, the cheque will be lodged in the bank account. If the cheque is settled with the bank, then Sales will arrange the shipment for the customer. The order will then be completed. | (10 marks) |
| (b) | <p>Draw a state chart diagram, showing all the states and transitions, of a toaster. Your diagram should show the <i>activities</i> associated with a particular state, the <i>events</i> that cause the <i>transitions</i>, along with any associated actions.</p> <ul style="list-style-type: none"> A toaster has two stable states. It is idle until a slice of bread is put inside the toaster and the power is switched on. The user may adjust the heating time by turning a knob on the toaster's side, while it is in the idle state. It remains in the heating state, unless conditions to transit it to the idle state are fulfilled. If the heating time, for toasting a slice of bread, has elapsed or if the user presses the eject button, the toast is ejected and the heating power is switched off. | (8 marks) |
| | <p>Question 4 Part (c) continued overleaf</p> | |

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| | Question 4 continued | |
| (c) | <p>Draw a sequence diagram representing the following process.</p> <p>Show when each <i>actor</i> is participating in each process, the <i>operation</i> carried out during each interaction, and the <i>arguments</i> associated with each operation.</p> <ul style="list-style-type: none"> • To make an online purchase from <i>Chapters.com</i>, a customer needs to select a book from a list displayed on the website and provide credit card information to the system. • The system, then, gets authorization from the bank for the payment, and, if positive, confirms the sale. • The order is then sent to the Orders' Department and when the book becomes available, it is shipped to the customer. • The Orders' Department charges the customer's credit card by informing the bank of the amount. | (12 marks) |

Total (30 marks)