



UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (*EXTERNAL*)

Academic Year 2006/2007 – 2nd Year Examination – Semester 3

*IT3102 – Object-Oriented Systems Development
PART 1 - Multiple Choice Question Paper*

17th March, 2007
(ONE AND A HALF HOURS)

Important Instructions:

- The duration of the paper is 1 ½ (**one and a half**) hours.
- The medium of instruction and questions is English.
- The paper has **35** questions and **12** pages.
- All questions are of the MCQ (Multiple Choice Questions) type.
- All questions should be answered.
- Each question will have 5 (five) choices with **one or more** correct answers.
- All questions will carry equal marks.
- There will be a penalty for incorrect responses to discourage guessing.
- The mark given for a question will vary from –1 (*All the incorrect choices are marked & no correct choices are marked*) to +1 (*All the correct choices are marked & no incorrect choices are marked*).
- Answers should be marked on the special answer sheet provided.
- Note that questions appear on both sides of the paper.
If a page is not printed, please inform the supervisor immediately.
- Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**

In questions 1-5, fill in the blanks with the most appropriate answer.

1) When an object carries out its operations, those operations are hidden from other objects and from the outside world, is known as

- | | | |
|-----------------|-------------------|------------------|
| (a) Inheritance | (b) Encapsulation | (c) Polymorphism |
| (d) Composition | (e) Aggregation | |

2) is a mechanism that lets one create new objects based on old ones.

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|-----------------|-----------------|------------------|
| (a) Inheritance | (b) Data hiding | (c) Polymorphism |
| (d) Composition | (e) Abstraction | |

3) is an extension of aggregation.

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|--------------------|------------------|-----------------|
| (a) Association | (b) Composition | (c) Inheritance |
| (d) Generalization | (e) Multiplicity | |

4) Object oriented languages allow an attribute to be described as, that is, invisible to outside the object.

- | | | |
|---------------|--------------|-------------|
| (a) Public | (b) Personal | (c) Private |
| (d) Primitive | (e) Global | |

5) is the process of picking out common features of objects and procedures, so that one can focus on a few concepts at a time.

- | | | |
|--------------------|-----------------|-----------------|
| (a) Polymorphism | (b) Composition | (c) Inheritance |
| (d) Generalization | (e) Abstraction | |

6) Which of the following statements is/are correct regarding Visual Modelling with UML and Rational Rose?

- | |
|---|
| (a) According to the text UML is a notation, not a methodology. |
| (b) UML models cannot be automatically transformed to other representations (e.g. Java). |
| (c) A Deployment Diagram displays the configuration of run-time processing elements and the software components, processes and objects which live on them. |
| (d) A Collaboration diagram displays the sequences of states which an object of an interaction goes through during its life in response to received stimuli, together with its responses and actions. |
| (e) Visual modelling is a way of thinking about problems using models organized around real-world idea. |

7) Which of the following statements is / are true regarding the inception phase of the Rational Unified Process?

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|---|
| (a) Establishment of the project plan and the architectural design is done in this phase. |
| (b) Supply the product to the user community. |
| (c) Focuses on completing the user document and preparing for user training |
| (d) Analyze the business ground for the proposed system and develop the iteration plan |
| (e) Build the product as a series of incremental iterations |

8) Considering the following statements in relation to Use Case modelling and identify the correct statements.

- (a) Communicate the system's functionality and behaviour to the customer and end user
- (b) Show object interactions arranged in time sequence
- (c) Illustrate the behaviour of the system under development
- (d) Starts in the Elaboration phase and then matures in the Construction phase
- (e) A graphical representation of the system's static object behaviour

9) Select from among the following, the correct statement(s) in relation to Objects.

- (a) Objects can be instances of more than one class.
- (b) The state of an object typically changes overtime.
- (c) Identity of an object means that each object is unique even if its state is identical to that of another object.
- (d) In UML, objects are represented using an Oval and the name of the object is underlined.
- (e) The behaviour of an object does not determine how an object responds to requests from other objects.

10) Consider the following properties,

- (i) Encapsulation
- (ii) Inheritance
- (iii) Recursion

Which of the above properties is/are included in the object oriented paradigm?

- (a) Only (i)
- (b) Only (ii)
- (c) Only (i) and (ii)
- (d) Only (i) and (iii)
- (e) All

11) Which of the following statements is/are correct in relation to classes?

- (a) Entity classes are sensitive to how the surroundings communicate with the system.
- (b) Boundary classes are used to model the system interfaces.
- (c) Entity classes are application dependent while control classes are application independent.
- (d) Control classes coordinate the events needed to realize the behaviour specified in the use cases.
- (e) Entity classes are also known as domain classes.

12) Which of the following statement(s) is/are correct?

- (a) Sequence diagrams show object interactions organized around the objects and their links to one another.
- (b) A state chart diagram shows the physical architecture of a computer based system.
- (c) A composite structure diagram models the internal structure of classes.
- (d) A timing diagram is drawn to show for how long an object is in a state.
- (e) In UML 2.0, the collaboration diagram is renamed as composite structure diagram.

13) Identify from among the following, the dynamic UML models.

- (a) The Class diagram
- (b) The Activity Diagram
- (c) The Communication diagram
- (d) The State chart diagram
- (e) The Sequence Diagram

14) Consider the following diagrams,

- (i) Use Case
- (ii) Sequence
- (iii) Collaboration

Which of the above diagrams is/are considered as an interaction diagram?

- | | | |
|-------------------------|-----------------------|----------------|
| (a) Only (i) | (b) Only (ii) | (c) Only (iii) |
| (d) Only (ii) and (iii) | (e) Only (i) and (ii) | |

15) Which of the following statements is/are correct?

- (a) The meaning of the multiplicity indicator $0..4$ is Zero or four.
- (b) Multiple objects belonging to the same class may have to communicate with one another. This can be shown on a class diagram as a reflexive association or aggregation.
- (c) An association is known as a “part-of” or containment relationship.
- (d) The end of an association where it connects to a class is called a relationship.
- (e) Whether a relationship in a class diagram is an association or an aggregation is often domain dependent.

16) Consider the following statements, related to actors in use case diagrams,

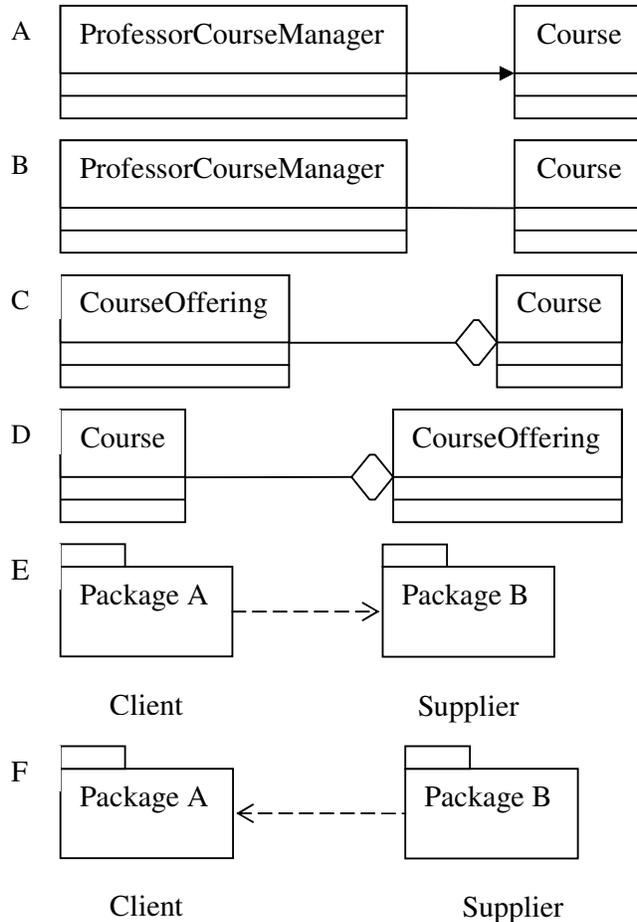
- (i) An actor may only input information to the system.
- (ii) An actor may only receive information from the system.
- (iii) An actor may input and receive information to and from the system.

Which of the above statements is/are correct?

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|-------------------------|-----------------------|---------------|
| (a) Only (i) | (b) Only (i) and (ii) | (c) Only (ii) |
| (d) Only (ii) and (iii) | (e) All | |

- 17) Consider the following statements.
- (i) Objects in the 'Course' Class are connected to objects in the 'ProfessorCourseManager' class.
 - (ii) A course may be offered at different times during the semester. Each offering is represented as a 'CourseOffering'.
 - (iii) The 'Package A' is dependent on 'Package B'.

Match each of the above statements with the following diagrams.



Which of the following statement – diagram combination is correct?

- | | | |
|--------------------------|--------------------------|--------------------------|
| (a) (i)-A (ii)-C (iii)-F | (b) (i)-B (ii)-C (iii)-E | (c) (i)-B (ii)-D (iii)-E |
| (d) (i)-A (ii)-D (iii)-F | (e) (i)-B (ii)-D (iii)-F | |

- 18) Consider the following statements in relation to *Use case* relationships :
- (i) Extend relationships are created between the new use case and any other use case that 'uses' its functionality.
 - (ii) Include and Extend relationships must use stereotypes while it is optional for associations.
 - (iii) Optional behaviours can be denoted using the 'Includes relation'.

Which of above statements is/are correct?

- | | | |
|-------------------------|-----------------------|----------------|
| (a) Only (ii) | (b) Only (i) and (ii) | (c) Only (iii) |
| (d) Only (ii) and (iii) | (e) All | |

19) The following statements are related to *State Charts*.

- (i) Even though State transition events along with their accompanying actions can be interrupted, the States, along with their accompanying activities cannot be interrupted.
- (ii) State Chart diagrams will not be created for every class in the system, but only for classes with a significant dynamic behaviour.
- (iii) A state chart diagram shows the states of a single object, the events or messages which cause a transition from one state to another and the actions which result from a state change

Which of the above statements is / are correct?

(a) Only (i) and (ii)	(b) Only (ii) and (iii)	(c) Only (i) and (iii)
(d) Only (iii)	(e) All	

20) Some questions related to UML with possible answers are given below.

- (i) Q. What is the UML Notation for a use case realization?
A. Use case realizations are drawn using a solid line oval shape.
- (ii) Q. What is the type of arrow used to show a synchronous message in a sequence diagram?
A. A filled arrow head at the end of a solid line
- (iii) Q. How does a collaboration diagram show messages?
A. A message is shown as a text and an arrow that points from the supplier to the client.

Which of the above question – answer combinations is/are valid?

(a) Only (ii)	(b) Only (iii)	(c) Only (i) and (ii)
(d) Only (ii) and (iii)	(e) None	

21) Consider the following multiplicity indicators and their meanings.

Indicator Meaning

- (i) 0..* Zero or More
- (ii) 1..* One or More
- (iii) 0..1 Zero or One
- (iv) 4,..7,9 4,5,6,7 or 9
- (v) 1-2 1 or 2

Which of the above is/are correct?

(a) (i), (ii) and (iii) only	(b) (ii) and (iii) only
(c) (i),(ii),(iii) and (iv) only	(d) (i), (ii) and (iv) only
(e) All	

22) Examine the contents of the following **Column A** against those of **Column B**.

Column A	Column B
(i) Handles the communication between the system surroundings and inside of the system	(A) Control Classes (B) Class (C) Entity Classes (D) Objects (E) Package (F) Boundary Classes
(ii) Model sequencing behaviour specific to one / more use cases	
(iii) A group of objects with common attributes and behaviour	
(iv) An instance of some class	

Which of the following gives a correct matching of the contents of **Column A** with those of **Column B**?

(a) (i)-C , (ii)-F , (iii)-E , (iv)- B	(b) (i)-A , (ii)- F , (iii)- E , (iv)- B
(c) (i)-F , (ii)-C , (iii)- B , (iv)-D	(d) (i)-F , (ii)-A , (iii)-B , (iv)-D
(e) (i)-C , (ii)-A , (iii)-B , (iv)-E	

23) Some questions related to State Charts with possible answers are given below,

- (i) Q. What is the UML representation for a state transition?
A. Such a state transition is represented by an arrow that points from the successor state to the originating state.
- (ii) Q. What is the UML notation to represent a state?
A. A rectangle
- (iii) Q. What is the UML notation for a stop state in state charts?
A. A small solid filled circle. E.g. ●

Which of the above question-answer combinations is/are valid?

- | | | |
|-------------------------|----------------|-----------------------|
| (a) Only (i) | (b) Only (iii) | (c) Only (i) and (ii) |
| (d) Only (ii) and (iii) | (e) None | |

24) Which of the following statements is/are correct regarding State Diagrams?

(a) They describe all of the possible states which a particular object can get into and how the object's state changes as a result of events which reach the object.

(b) The following is an example of a UML State Diagram.

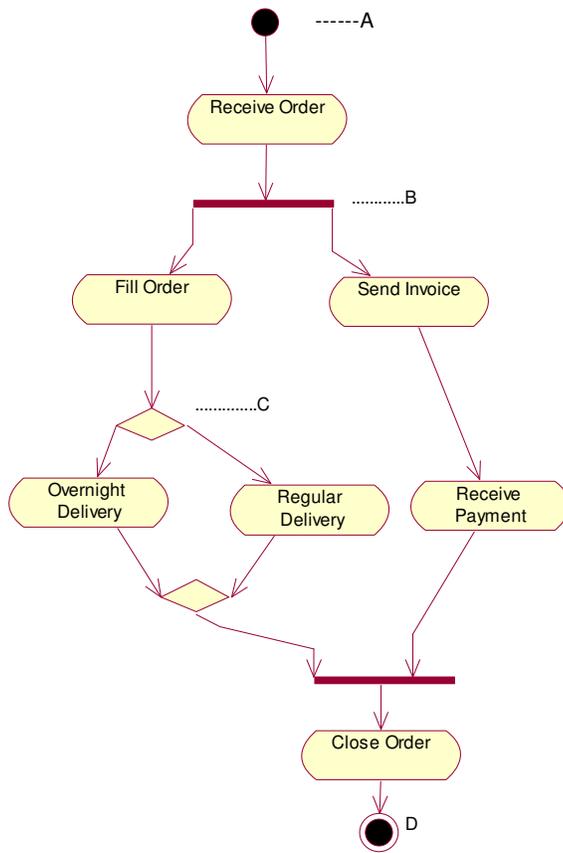
The diagram shows four states: 1. .Registrar (represented by a stick figure), 2. course form : (Logical View::UniversityArtifacts::Cou (represented by a circle), 3. the Manager : (Logical View::UniversityArtifacts:: (represented by an oval), and 4. a Course : (Logical View::UniversityArtifacts::Cou (represented by a yellow circle). Transitions are: 1: set course info, 2: process (from Registrar to course form); 3: add course (from course form to the Manager); 4: new course (from the Manager to a Course).

(c) State Diagrams are good at describing the behaviour of an object across several use cases.

(d) They are good at describing the behaviour that involves a number of collaborating objects.

(e) They should be drawn for every class in the system.

25) Consider the following UML diagram.



Which of the following statements is/are correct regarding the above diagram?

- (a) It is an example of a State Diagram.
- (b) Symbol A indicates the *Start* state and symbol D indicate the *Stop* state.
- (c) Symbol B indicates a parallel activity. When the incoming transition is triggered, all of the outgoing transitions take place in parallel.
- (d) Order can be closed only after it is delivered and paid for.
- (e) Symbol C which is a decision symbol indicates the following:
 “If it is a rush order the activity, *Overnight Delivery* will be performed otherwise *Regular Delivery* will be performed”.

26) Which of the following statements is/are correct regarding UML physical diagrams?

- (a) A Deployment diagram shows the physical relationships between software components and hardware components in the delivered system.
- (b) Each node in a deployment diagram represents some kind of computational unit such as a piece of hardware.
- (c) A Component diagram shows the various components in a system and their dependencies.
- (d) A component in a component diagram represents a problem domain class.
- (e) The dependencies among the components show how changes to one component may cause other components to change.

Questions 27-31 will be based on the following case study.

The major business activities of a mail order company can be briefly described as follows:

A Customer registers as a member by filling in the membership form and mailing it to the company. A member who has not been active (no transactions made) for a period of one year will be removed from the membership list. Subsequently he needs to re-apply for the reinstatement of the lapsed membership. A member should keep the company informed of any change in personal details such as home address, telephone numbers etc.

A member can place an order by filling out a sales order form and faxing it to the company or by phoning the Customer Service Assistant with the order details.

The Customer Service Assistant first checks for the validity of membership and enters the sales order information into the system.

The Order Processing Clerk checks the availability of each of the ordered items. If an item is available, he holds it for the order. All the available items will be scheduled for delivery.

The Inventory Control clerk controls and maintains an appropriate level of stock and is also responsible for acquiring new items.

If there is a problem with an order, the member will phone the Customer Service Assistant, who will then take appropriate action to follow up the particular sales order.

Members may return defective goods within 30 days and get their money back.

The system will record the name of the staff member who handled the transaction for future follow up action.

27) Which of the following is/are identified as the major actors of the above system?

- | | |
|--------------------------------|----------------------------|
| (a) Customer Service Assistant | (b) Order Processing Clerk |
| (c) Inventory Control Clerk | (d) Mail Order System |
| (e) Customer | |

28) The following is a specification of one of the actors.

‘ He is responsible for processing sales orders, submitting order requests, requesting necessary deposits from members and scheduling the delivery of the goods to the member’

Identify the actor responsible for the above functions.

- | | |
|--------------------------------|-----------------------------|
| (a) Customer Service Assistant | (b) Order Processing Clerk. |
| (c) Inventory Control Clerk | (d) Mail Order System |
| (e) Customer | |

29) Consider the following functions.

- (i) Update Membership record
- (ii) Archive Membership
- (iii) Register New Member

Which of the actors is/are responsible for the above functions?

- | | |
|--------------------------------|----------------------------|
| (a) Customer Service Assistant | (b) Order Processing Clerk |
| (c) Inventory Control Clerk | (d) Mail Order System |
| (e) Customer | |

30) Identify the possible package(s) for the initial use case model.

- | | |
|-----------------------|-----------------|
| (a) Mail Order System | (b) Membership |
| (c) Inventory Control | (d) Place order |
| (e) Order Goods | |

31) Initial use case description of a use case is given below.

'The Order Processing Clerk selects an order from the list of filled sales orders. The system displays the sales order details, together with the member's telephone number and address. The Order Processing Clerk enters the delivery date and time after talking with the member over the phone. The system records the delivery date and time in a dispatch request to the delivery team.'

From among the following, identify the use case.

- | | |
|-----------------------|-------------------------|
| (a) Process Order | (b) Handle Goods Return |
| (c) Receive Goods | (d) Order Goods |
| (e) Schedule Delivery | |

32) Consider the following code segment.

```
#include<iostream.h>

void main()
{
int x=5;
int product=5;
int quotient=5;
product *=x++;
quotient /=++x;
cout<<product<<"", "<<quotient<<"", "<<x<<endl;
}
```

Which of the following would be the output after the calculation is performed?

- | | | |
|--------------|--------------|--------------|
| (a) 25, 0, 6 | (b) 25, 0, 7 | (c) 30, 0, 7 |
| (d) 30, 1, 7 | (e) 25, 1, 7 | |

33) Identify from among the following, the correct statement(s) related to C++.

- | |
|---|
| (a) After executing $x=2 \% 2 + 2 * 2 - 2 / 2$ the value of x will be one. i.e. $x=1$ |
| (b) Placing a semi-colon immediately to the right parenthesis of a <i>for</i> header, makes the body of that <i>for</i> structure an empty statement. |
| (c) To declare variables x, y and z all as references to integers, one can use the notation, <code>int& x=a, y=b, z=c;</code> |
| (d) One can initialize an array table with three rows and three columns using the code segment <code>int table[3][3]={{1,8},{2,4,6},{5}}</code> . |
| (e) A pointer that is declared to be void can be de-referenced. |

34) Consider the following code segment:

```
#include<iostream.h>
class Count{
public:
    int x;
    void print() { cout << x<<endl;}
};

int main()
{
    Count counter,
        *counterPtr = &counter,
        &counterRef=counter;
    cout<<"Assign 7 to x and print using the object's name: ";
    counter.x = 7;
    counter.print();

    cout<<"Assign 8 to x and print using a reference: ";
    counterRef->x = 8;
    counterRef->print();

    cout<<"Assign 10 to x and print using a pointer: ";
    counterPtr.x = 10;
    counterPtr.print();
}
```

Which of the following statements will be correct regarding the above code segment?

- | |
|--|
| <p>(a) Variable countRef is defined to reference to counter.
(b) Variable countPtr is defined to point to counter.
(c) It provides the output as</p> <p style="text-align: center;">Assign 7 to x and print using the object's name: 7
Assign 8 to x and print using a reference: 8
Assign 10 to x and print using a pointer: 10</p> <p>(d) It gives Compilation errors.
(e) Variable x is a global variable of type int while print() is a private member function.</p> |
|--|

35) Consider the following code segment, which generates an 'Error' when compiling/executing.

```
class Example {
public:
    Example(int y=10)
    { data = y ;}

    int getIncrementedData () const
    {return ++data;}

    static int getCount()
    {
        cout << "Data is " <<data <<endl;
        return count;
    }
private:
    int data;
    static int count;
};
```

Also consider the following statements which describe error- solution pairs for the above code segment.

- (i) Error : The const keyword should be used prior to the return type of the function definition.
Solution: const int getIncrementedData ()
- (ii) Error: The function getCount is declared as static and therefore it is not possible to access the variable data.
Solution: Remove the output line from the function.
- (iii) Error: The function getIncrementedData is declared as const and therefore one can not modify the variable data.
Solution: Use the variable count instead of the variable data.

Which of the above pairs best describe(s) the outcome of the above code segment?

(a) (ii) Only	(b) (iii) Only	(c) (ii) and (iii) Only
(d) (i) Only	(e) All	
