



**UNIVERSITY OF COLOMBO, SRI LANKA**



**UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING**

*(Successor to the Institute of Computer Technology (ICT), University of Colombo)*



**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)**

***Academic Year 2003/2004 – 2<sup>nd</sup> Year Examination – Semester 1***

***IT3101 – Object-Oriented Systems Development***

***PART 1 - Multiple Choice Question Paper***

**28<sup>th</sup> February, 2004  
(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) Typically, ..... represents a role that a human, a hardware device or even another system plays with a system.

(a) a Use Case	(b) an Actor	(c) a Class
(d) a Component	(e) a Package	

- 2) One can specify the behaviour of a/an ..... by describing a flow of events in text sufficiently clearly for an outsider to understand it easily.

(a) Use Case	(b) Object	(c) State
(d) Class	(e) Package	

- 3) ..... represents a 'has-a' or 'whole-part' relationship, meaning that an object of the whole has objects of the parts.

(a) Generalization	(b) Inheritance	(c) Multiple inheritance
(d) Aggregation	(e) Association	

- 4) A/An ..... represents a change from an originating state to a successor state.

(a) association	(b) aggregation	(c) generalization
(d) dependency	(e) state transition	

- 5) An ..... relationship specifies that the target use case explicitly incorporates the behaviour of another use case at a location specified by the source.

(a) Inheritance	(b) Include	(c) Aggregation
(d) Association	(e) Extend	

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

(a) UML is merely a language, and an appropriate software development method should be incorporated with it to develop software systems.
<del>(a)</del> (b) Visual Modelling has a common vocabulary called the Unified Modelling Language.
<del>(b)</del> (c) Rational Rose is the only object oriented CASE tool that supports UML.
<del>(e)</del> (d) Rational Rose has the capability to create models from existing components and applications, also known as reverse engineering.
<del>(d)</del> (e) Latest Rational Rose versions allow one to publish Rose models in the web.

- 7) Which of the following statements is/are correct regarding the Rational Unified Process (RUP)?

(a) It is an iterative process having the flexibility to accommodate new requirements or tactical changes in business objectives.
(b) It captures some of the best current software development practices in a form that is tailorable for a wide range of projects and organizations.
(c) It does not focus on early development of software architecture.
(d) Inspection phase of RUP establishes a project plan and a sound architecture.
(e) Elaboration phase of RUP establishes the business case for the project.

8) Consider the following statements in relation to Use Case modelling. Identify the correct statements.

- (a) The collection of Use Cases for a system constitutes all the defined ways in which the system may be used.
- (b) Actors represent anyone or any thing that must interact with the system.
- (c) *Extends* relationship shows the compulsory behavior of a Use Case.
- (d) The *flow of events* for a Use Case is a description of events needed to accomplish the required behaviour of the Use Case.
- (e) A Use Case describes what a system does but it does not specify how it is done.

9) Which of the following statements is/are correct regarding identifying Classes, Packages and drawing a Class diagram?

- (a) A Class diagram describes the types of objects in the system and the various kinds of static relationships which exist among them.
- (b) A Stereotype is a mechanism one can use to categorize his classes.
- (c) *Entity* and *Control* are the two primary Class stereotypes in UML.
- (d) Packages are used to arrange modelling elements into larger chunks which one can manipulate as a group.
- (e) A Class is a description of a group of objects with common properties, common behaviour and common relationships to other objects and common semantics.

10) Consider the following statements in relation to object oriented concepts:

- (i) *Classes* represent the concepts which are to be modelled.
- (ii) *Composition* is a special form of *aggregation* in which the individual parts depend on the aggregate (the whole) for their existence.
- (iii) *Objects* communicate with each other through message interactions.

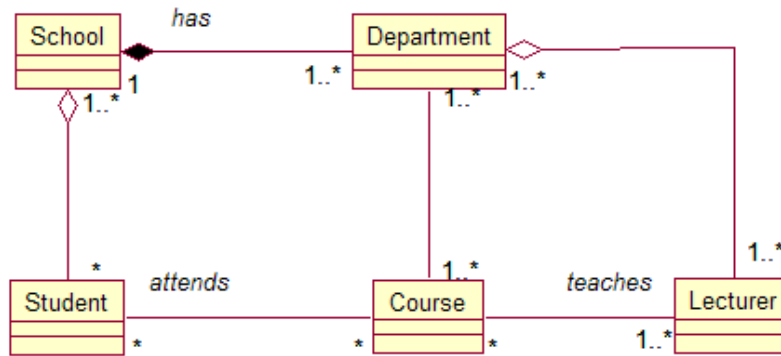
Which of the above statements is true?

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

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

- (a) Object Oriented methodology consists of a process, a vocabulary and a set of rules and guidelines.
- (b) A model can be used as a template that guides us in constructing a system.
- (c) In *Rational Rose*, a system can have several different models, if needed.
- (d) Use Case view is the heart of the other views because it specifies the forces which shape the system's architecture.
- (e) The Use Case model is used in logical view to represent the system's intended functions and environment as seen by its end users.

Questions 12-15 will be based on the following diagram.



12) Which of the following statements is/are true about the above diagram?

- (a) It shows a set of components drawn from an information system for a school.
- (b) It shows a set of classes drawn from an information system for a school.
- (c) There is an association between *Student* and *Course*, specifying that a student attends one or more course(s).
- (d) One *Course* object is related to many *Student* objects.
- (e) '*attends*' is a role name for the *Student* class.

13) Which of the following statements is/are correct regarding the given diagram?

- (a) Relationship between *School* and *Department* is a *generalization* relationship.
- (b) Relationship between *School* and *Department* is a simple *aggregation* relationship.
- (c) Relationship between *School* and *Department* is a *composition* relationship.
- (d) Relationship between *School* and *Student* is a *generalization* relationship.
- (e) '*teaches*' is the relationship name given for the *association* relationship that exists between *Course* and *Lecturer*.

14) Consider the following statements.

- (i) A student may belong to one or more schools.
- (ii) A department may belong to one or more schools.
- (iii) A lecturer must be associated with one and only one department.

Which of the above statements is/are correct about the above diagram?

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

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

- (a) If a school no longer exists, a student belonging to such school cannot exist in the system.
- (b) If a school no longer exists, a student who belonged to such school may continue to exist in the system.
- (c) If a school no longer exists, the departments belonging to the school cannot exist in the system.
- (d) If a school no longer exists, the departments belonging to the school will exist in the system.
- (e) *Department* and *Lecturer* relationship is modelled as an aggregation because organizationally, departments are at a higher level in the school's structure than are lecturers.

16) Which of the following is/are correct regarding diagrams in UML?

- (a) A sequence diagram and a collaboration diagram are both called interaction diagrams.
- (b) Interaction diagrams are used in UML to model the dynamic aspects of systems.
- (c) An interaction diagram shows an interaction, consisting of a set of objects and their relationships, including the messages which may be dispatched from one to another.
- (d) A collaboration diagram emphasizes the time ordering of messages.
- (e) A sequence diagram emphasizes the structural organization of the objects which send and receive messages.

17) Consider the following statements related to UML.

- (i) An Activity diagram is used in UML to model the dynamic aspects of systems.
- (ii) A State chart diagram is a UML diagram used to model the static aspects of systems.
- (iii) A Sequence diagram is used in UML to model the dynamic aspects of systems.

Which of the above statements is/are correct?

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

18) Select from among the following, the correct statement(s) regarding C++.

- (a) C++ variables are case sensitive and must begin with a letter.
- (b) *new* is a valid variable.
- (c) \$int1 and \_int are valid variables.
- (d) C++ keywords cannot be used as variable names.
- (e) Member functions, unless specified otherwise, are by default, private.

19) Select from among the following, the correct statement(s) regarding interaction diagram and collaboration diagrams.

- (a) Sequence diagrams and Collaboration diagrams model the same two elements: messages and objects.
- (b) An advantage of the sequence diagram is its ability to show the creation and destruction of objects.
- (c) A collaboration diagram is an interaction diagram that emphasizes the time ordering of messages.
- (d) In UML, an object in a sequence diagram is drawn as a rectangle, containing the name of the object, underlined.
- (e) Sequence diagrams and Collaboration diagrams are so similar that some tools like Rational Rose provide a toggle feature to switch back and forth between the two views.

20) Consider the following program.

```
void main ()
{
    int i=1;
    do {
        cout<<"L="<<i; i++; break;
    }
    while(i<100);
}
```

Identify, from among the following, the correct descriptions in connection with the above program.

- (a) The loop is of the non-terminating type.
- (b) When executed, the first line that displays is: L=1.
- (c) If break is replaced with *continue*, the loop will never be terminated.
- (d) When executed, the last line that displays is: L=99.
- (e) The loop body will be repeated 100 times.

21) Select from among the following, the correct statement(s) related to state transition diagrams.

- (a) A state is a condition or situation during the life of an object during which it satisfies some condition, performs some activity, or waits for some event.
- (b) The following are the two UML symbols used for initial and final states and these are two special states which may be defined for an object's state machine.



Initial State

Final State

- (c) A transition is a relationship between two states indicating that an object in the first state will perform certain actions and enter the second state when a specified event occurs and specified conditions are satisfied.
- (d) A transition may have multiple sources as well as multiple targets.
- (e) In the context of state machines, an event is an occurrence of a stimulus which can trigger a state transition.

22) Consider the following statements in relation to state transition diagrams in UML:

- (i) A *guard condition* in a state is rendered as a Boolean expression, enclosed in square brackets and placed after the trigger event.
- (ii) A *guard condition* is evaluated before the trigger event for a state transition to occur.
- (iii) The following is the UML state symbol with only the name compartment shown.

Cancelled

- (iv) Internal transitions are transitions which are handled without causing a change in state.

Which of above statements is/are correct?

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

- 23) Consider the following incomplete statements related to structure and behaviour of an object in UML:
- (i) A/An .....is a named property of a class that describes a range of values which an instance of the property may hold.
  - (ii) The following is an example of a ..... attribute in UML.  
# radius :integer
  - (iii) A ..... is the UML symbol used for *public* attributes in objects.

Identify from among the following, the correct order to fill the above blanks.

- |   |
|---|
| <ul style="list-style-type: none"> <li>(a) attribute, <i>public</i>, #</li> <li>(b) attribute, <i>private</i> , .</li> <li>(c) attribute, <i>public</i>, #</li> <li>(d) service, <i>protected</i>, +</li> <li>(e) attribute, <i>protected</i>, +</li> </ul> |
|---|

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

- (i) How many different types of components are there in UML?  
There are three.
- (ii) What does one call the relationship between a component and its interface?  
Realization.
- (iii) How does one represent a node in a deployment diagram?  
By a cube.

Which of the above question-answer combinations is true?

- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"> <li>(a) Only (iii)</li> <li>(d) Only (i), (iii)</li> </ul> | <ul style="list-style-type: none"> <li>(b) Only (ii) and (iii)</li> <li>(e) All</li> </ul> | <ul style="list-style-type: none"> <li>(c) Only (i) and (ii)</li> </ul> |
|---|--|---|

- 25) Consider the following incomplete statements related to architectural views in UML:

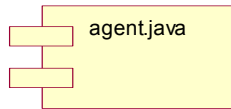
- (i) ..... is the heart of the other views because it specifies the forces which shape the system's architecture.
- (ii) ..... includes the threads and processes which form the system's concurrency and synchronization mechanisms.
- (iii) ..... is used for distributed systems only.
- (iv) ..... shows how the various executables and other run time components are mapped to the underlying platforms or computing nodes.
- (v) ..... describes the organization of static software modules in terms of packaging, layering and configuration management.

Identify from among the following, the correct order to fill the above blanks.

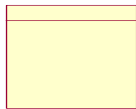
- |  |
|--|
| <ul style="list-style-type: none"> <li>(a) Logical view, Component view, Deployment view, Process view, Implementation view</li> <li>(b) Use case view, Implementation view, Process view, Deployment view, Component view</li> <li>(c) Use case view, Process view, Deployment view, Deployment view, Implementation view</li> <li>(d) Logical view, Process view, Deployment view, Deployment view, Implementation view</li> <li>(e) Use case view, Process view, Component view, Deployment view, Component view</li> </ul> |
|--|

- 26) Select from among the following, the correct statement(s) in relation to component diagrams and deployment diagrams.

- (a) One uses components to model logical things which may reside on a node, such as executables, libraries, tables, files and documents.  
 (b) The UML notation for a *component* is given below.



- (c) The UML notation for a *node* is given below.



- (d) The processors which can execute components and devices which connect to the outside world are the two kinds of nodes which a deployment diagram can contain.  
 (e) Information on a node can include the node name package name, and components deployed on the node.

- 27) Examine the contents of the following column A with those of column B.

Column A

- (i) Provides capability to reuse successful designs and architecture
- (ii) Helps to refresh the model from the code
- (iii) In this view of the system, it was decided to use 3-tier architecture to develop the system
- (iv) Decides to use active-X, DLLs, Applets etc.
- (v) Programming Language, Database access method of the system etc., are decided.

Column B

- (A) Implementation view
- (B) Patterns
- (C) Reverse Engineering
- (D) Logical view
- (E) Process view

The following gives a matching of the contents of Column A with those of Column B.

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

- 28) In C++, a non-member function in a class must be declared to have access to that class's private data members using the keyword

- (a) friend. (b) static. (c) constant.  
 (d) new. (e) free.



- 29) Some questions related to UML with possible answers are given below.
- (i) How many sequence diagrams are required in order to create a state chart diagram?  
Only one.
  - (ii) What is the purpose of a dependency arrow in a package diagram?  
It shows that one or more classes in one package need(s) to interact with a class or classes in another package. The direction of the arrow indicates as to who has the need (the head of the arrow) and who supplies the need (base of the arrow).
  - (iii) How is the relationship modelled between components when one component needs access to another component?  
Dependencies between components are drawn with the dashed arrow from the dependent component to the component it needs help from.

Which of the above question-answer combinations is true?

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

- 30) A copy constructor is invoked when

- (a) an argument is passed by value.
- (b) a function returns by value.
- (c) a function returns by reference.
- (d) an argument is passed by reference.
- (e) a new variable is created from an object.

- 31) Assume a class *child* that is privately derived from class *parent*. An object of class *child* located in *main()* can access

- (a) Private members of *child*.
- (b) Public members of *parent*.
- (c) Public members of *child*.
- (d) Private members of *parent*.
- (e) Protected members of *child*.

- 32) The scope resolution operator

- (a) limits the visibility of variables to a certain function.
- (b) tells what base class, a class is derived from.
- (c) is used to derive classes from a base class.
- (d) resolves ambiguities.
- (e) tells to which base class a function belongs.

33) Consider the following program.

```
# include <iostream.h>

class myclass
{
    int a,b;
public:
    myclass(int i, int j)
    {
        a=i;
        b=j;
    }
};

int sum(myclass x)
{
    return x.a+x.b;
}

int main()
{
    myclass n(3,4);
    cout<<sum(n);
    return 0;
}
```

Which of the following would be the output of the above program?

- |                   |             |        |
|-------------------|-------------|--------|
| (a) Compile error | (b) 7       | (c) 12 |
| (d) 0             | (e) 3, 4, 7 |        |

34) Consider the following program

```
#include <iostream.h>

class A{
public:
    A(){cout<<"In A\n";}
    ~A(){cout<<"Out A\n";}
};

class B: public A{
public:
    B(){cout<<"In B\n";}
    ~B(){cout<<"Out B\n";}
};

void main()
{
    B ob;
}
```

What would the output of the program be?

- |                                    |                                    |                  |
|------------------------------------|------------------------------------|------------------|
| (a) In A<br>In B<br>Out B<br>Out A | (b) In A<br>In B<br>Out A<br>Out B | (c) In A<br>In B |
| (d) In A<br>Out A<br>In B<br>Out B | (e) In A                           |                  |

35) Consider the following program.

```
#include <iostream.h>
using namespace std;
class base
{
    int a,b;
public :
    base(int i, nt j)
    {
        a=i; b=j;
    }
    void show()
    {
        cout<<a<<' '<<b<<'\n';
    }
};

class derived : public base
{
    int c;
public :
    derived( int x, int y, int z): base (x,y)
    {
        c=z;
    }
    void show()
    {
        cout<<a<<' '<<b<<c<<'\n';
    }
};

int main()
{
    derived ob(3,4,5);
    ob.show();
    return 0;
}
```

Which of the following would be the output of the above program?

- |                   |             |         |
|-------------------|-------------|---------|
| (a) 3 4 5         | (b) 3, 4, 5 | (c) 345 |
| (d) Compile error | (e) 0       |         |

\*\*\*\*\*