University of Colombo, Sri Lanka

University of Colombo School of Computing

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2023— 2^{nd} Year Examination — Semester 3

IT3106 — Object Oriented Analysis & Design

Part 1 - Multiple Choice Question Paper

(2 Hours for both Part 1 and Part 2)

Important Instructions

- This paper has **two (2) parts, Part 1 and Part 2**.
- The total duration of **both Part 1 and Part 2 is 2 hours**.
- The medium of instructions and questions is English.
- This paper (Part 1) has **25 MCQ questions** on **8 pages**. Answer **all** questions.
- Each question will have **5 (five)** choices with **ONE OR MORE** correct answers.
- 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). However, **the minimum mark per question would be zero**.
- Answers should be marked on the **special answer sheet** provided.
- Note that questions appear on both sides of the paper. If a page or part of a page is not printed, please inform the supervisor/invigilator 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.**
- Any electronic device capable of storing and retrieving text, including electronic dictionaries, smartwatches, and mobile phones, is not allowed.
- Calculators are **not** allowed.
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1) Which term from (a) to (e) is the most appropriate to fill the blank in the following statement?
……. is the process of combining data and methods that operate on the data within a single unit.

(a) Inheritance	(b) Encapsulation	(c) Polymorphism
(d) Abstraction	(e) Specialization	

2) Rectangle and Triangle are two classes, having a method called findArea(). Though the name and the purpose of the methods in the classes are the same, the internal implementation, i.e., the procedure of calculating the area is different for each class. When an object of class Rectangle invokes its findArea() method, the operation finds the area of the Rectangle without any conflict with the findArea() method of the Triangle class.
In object-oriented paradigm above is an example of ……..

(a) Polymorphism	(b) Inheritance	(c) Encapsulation
(d) Generalization	(e) Abstraction	

3) Consider the following examples:
(i) "Dog is an Animal".
(ii) "Aircraft has Engines".
(iii) "House has Rooms".

Which of the above examples represents the Generalization and specialization relationship?

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

4) Consider the following statements:
(i) The type of polymorphism achieved through method overloading is compile-time polymorphism.
(ii) Inheritance is a concept that allows you to create new classes by extending existing classes and it defines an "is-a" relationship between classes, where the new class inherits the properties and behaviors of the existing class called the base class.
(iii) Encapsulation is the core principle of bundling data and related methods together within a class, protecting data integrity and promoting modularity.

Which of the above statements related to Object oriented concepts is/are true?

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

5) Identify the correct statements related to Unified Process.

(a) The Unified Process is a two-dimensional systems development process described by a set of phases and workflows.
(b) In the *Inception* phase, a business case is made for the proposed system which includes a feasibility analysis that should answer questions such as the following:
(i) Do we have the technical capability to build it?
(ii) If we build it, will it provide business value?
(c) The activities related to the *Construction* phase of the Unified Process are the most relevant to object-oriented systems analysis and design
(d) The primary deliverables of the *Elaboration* phase include:
(i) the UML structure and behavior diagrams.
(ii) description of the software architecture
(iii) an executable of a baseline version of the evolving information system.
(e) The primary goal of the *Construction* phase is to ensure a smooth transition from development to production.

6) Which of the following is/are correct regarding CASE tools?

(a) Integrated Case tools help all the SDLC stages, from Requirement gathering to testing and documentation.
(b) GitHub is a web-based platform that offers version control and collaboration features for software developers and allows developers to store their code, track changes, and work together on projects.
(c) Visual Paradigm is an integrated development environment from Microsoft which is used to develop computer programs, as well as websites, web apps, web services and mobile apps.
(d) PlantUML can be used by visually impaired people to create and read diagrams thanks to its text-based approach.
(e) Adobe Dreamweaver is an exclusive software program and programming editor that is used for creating websites and also it supports many markup languages like CSS, XML, HTML, and JavaScript.

7) Which of the following statements related to Use Case modelling is/are correct?

(a) Use case modelling is a powerful technique in software development that bridges the gap between user needs and system functionalities.
(b) It is a process of capturing, analyzing, and documenting the interactions between users and a system, providing a roadmap for developers to translate user requirements into concrete actions and features.
(c) A Use Case narrative is a concise, informal, and user-centric description of a software feature or functionality and often follows a simple template like "As a [user type], I want [something] so that [benefit]."
(d) Use Cases are initially defined during the analysis stage of the life cycle and will be additionally refined during the design stage.
(e) Can be used in non-object oriented development environments.

8) Which of the following is/are correct regarding Business Process identification with Use Case modelling?

(a) There is no standard set of notations for Use Case Modelling.
(b) An Actor in a Use Case model has to be placed outside the subject boundary.
(c) An *include* relationship represents the inclusion of the functionality of one Use Case within another and has an arrow drawn from the base Use Case to the inclusion use case.
(d) An *extend* relationship is a type of relationship that allows you to incorporate optional behavior into a base Use Case under certain conditions and it's a way to extend the functionality of a base Use Case without making that functionality mandatory.
(e) A base Use Case can have multiple *extend* relationships with different extension Use Cases.

9) Some questions related to UML Class Diagrams with possible answers are given below.

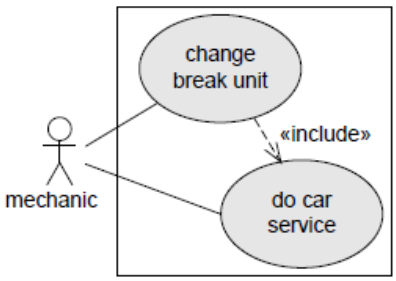
(i) Q. What is the primary purpose of Use Case modelling in software development?
A. To design user interfaces
(ii) Q. What is a Use Case scenario?
A. A detailed description of a specific interaction between an actor and the system.
(iii) Q. What does the term "alternative flow" refer to in use case modelling?
A. A secondary path of execution within a use case that occurs under specific conditions

Which of the above pairs is/are correct?

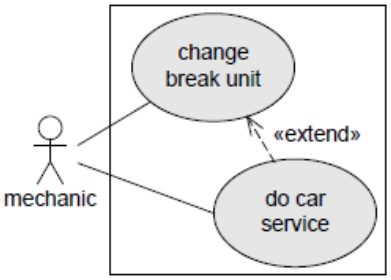
(a) Only (ii) (b) Only (iii) (c) Only (i) and (iii) (d) Only (ii) and (iii) (e) All (i) , (ii) and (iii)

10) Three (3) students were asked to model the following scenario using the UML2 Use Case diagram:
Scenario: "A mechanic does a car service. During that service, it might be necessary to change the brake unit."

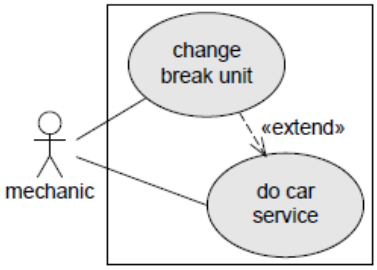
Below are the answers provided by the students.



Student A



Student B

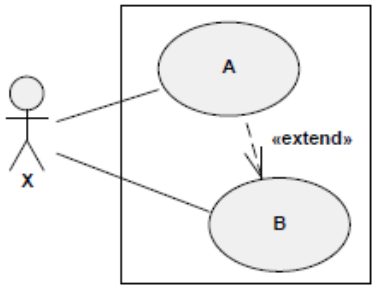


Student C

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

(a) Student A's answer is correct
(b) Student B's answer is correct
(c) Student C's answer is correct
(d) In Student A's answer, the mechanic always has to do car service when change the brake unit.
(e) In Student B's answer , the arrow points in the wrong direction. change brake unit should extend do car service and not the other way round

11) Which of the following is/are correct regarding the Use Case diagram given below?



(a) 'A' can extend 'B'
(b) 'B' can extend 'A'
(c) 'B' might or might not invoke 'A'
(d) 'B' can be executed instead of 'A'
(e) 'A' cannot be executed without 'B'

12) Consider the following statements regarding Business Process Modelling with Activity Diagrams?

(i) They are a type of behavioral diagram that shows the flow of activities within a system or a process and are particularly useful for modeling business processes, workflows, and other dynamic aspects of a system.
(ii) Fork nodes are represented by diamonds and they indicate the point at which multiple paths of control converge back into a single path.
(iii) Fork nodes represent the point where the control flow splits into parallel paths, while join nodes represent the point where these parallel paths converge back into a single flow.

Which of the above statement/s is/are correct?

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

13) Consider the following Activity diagram and the given action sequence(s) in (i),(ii) and (iii) during one execution of the activity diagram.

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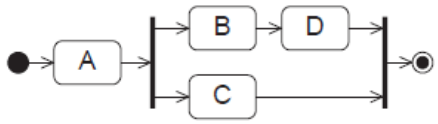


(i) A->B->D->C

(ii) A->B->C->D

(iii) A->C->B->D

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

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

14) Consider the following statements related to structural modelling.

(i) Structural models represent the things, ideas, or concepts contained in the domain of the problem and also allow the representation of the relationships among the things, ideas, or concepts

(ii) The most common approaches used in identifying a set of candidate objects for the structural model are Textual analysis, Brainstorming, Common object lists, and Patterns.

(iii) The *nouns* in the use case suggest possible Classes and the *verbs* suggest possible operations.

Which of the above statements is/are true?

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

15) Which of the following statements related to *association* relationships in UML Class diagrams is/are correct?

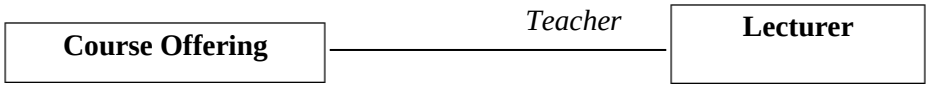
(a) In UML Class diagrams, an *association* relationship represents a connection or link between two or more classes and illustrates how instances of classes are related to each other within a system.

(b) *Associations* line may have arrows indicating the direction of the *association*, and multiplicity notations can be used to specify the number of instances involved on each end.

(c) A "1..*" multiplicity on one end of the *association* line indicates that one instance of the class is associated with one or more instances of the other class.

(d) Arrowheads on one or both ends of the *association* line indicate the direction of navigability.

(e) The following is a valid example for *association* relationship with *Teacher* as the relationship name.



16) Consider the following statements related to *Structural* models.

(i) Class, Object, Component and Deployment are examples of UML *structural* models.

(ii) Structural models in UML are used to represent the static structure of a system, emphasizing the organization and composition of its elements.

(iii) Package diagrams which organize model elements into packages for better management do not fall into structural models.

Which of the above statement/s is/are correct?

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

17) Which of the following statements related to *Class* diagrams is/are correct?

(a) *Class* diagrams specifically focus on instances of classes and their relationships at a particular point in time.
(b) *Class* diagrams are widely used during the analysis and design phases of software development to model the conceptual aspects of a system and its organization.
(c) *Class* diagrams serve as a visual communication tool among stakeholders, including developers, architects, and business analysts, providing a common understanding of the system's structure.
(d) Some CASE tools can automatically generate code skeletons from class models.
(e) They focus on the physical structure of a software system, representing its components, their interfaces, and the relationships between them.

18) Which of the following statements is/are correct regarding the UML *Class* diagram?

(a) It shows the classes, attributes, operations, and the relationship between them and helps software engineers in developing the code for an application.
(b) *Class* diagrams are one of the most important diagrams in coding as they form the basis for component and deployment diagrams and describe the responsibilities of a system.
(c) It is a visual representation of the structure and relationships of classes in a system.
(d) *Class* diagrams help organize code into logical units, promoting modularity and reusability.
(e) It focuses on the physical aspects of a system instead of the logical ones and can think of it as a blueprint for how the pieces of your software will be laid out in the real world.

19) Which of the following statements related to Structural Modelling and verifying and validating Structural Models is/are correct?

(a) A package diagram is effectively a class diagram that only shows packages and they are used to simplify complex class diagrams.
(b) Walkthroughs with the power of role-playing can be used to completely verify and validate the structural model that will underlie the business processes and functional models.
(c) Verification focuses on ensuring the model's internal consistency and adherence to UML rules, while validation ensures the model accurately reflects the intended system and meets user requirements.
(d) Structural models describe the internal dynamic aspects of an information system that supports the business processes in an organization.
(e) During analysis, structural models describe what the internal logic of the processes is without specifying how the processes are to be implemented.

20) Which of the following statements related to Behaviour Modelling is/are true?

(a) The following are two interaction diagrams used in behavior modelling.
Communication Diagram, Timing Diagrams
(b) Behavioural models describe the internal dynamic aspects of an information system that supports the business processes in an organization.
(c) *Communication* diagrams show the object interactions arranged in time sequence.
(d) *Sequence* Diagrams show the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.
(e) Actual messages from the *actor* to the boundary *class* with their sequencing information will depend on the application framework that will be selected later in development.

21) Consider the following statements related to *State* diagrams.

(i) A behavioral state machine is a dynamic model that shows the different states through which a single object passes during its life in response to events, along with its responses and actions.

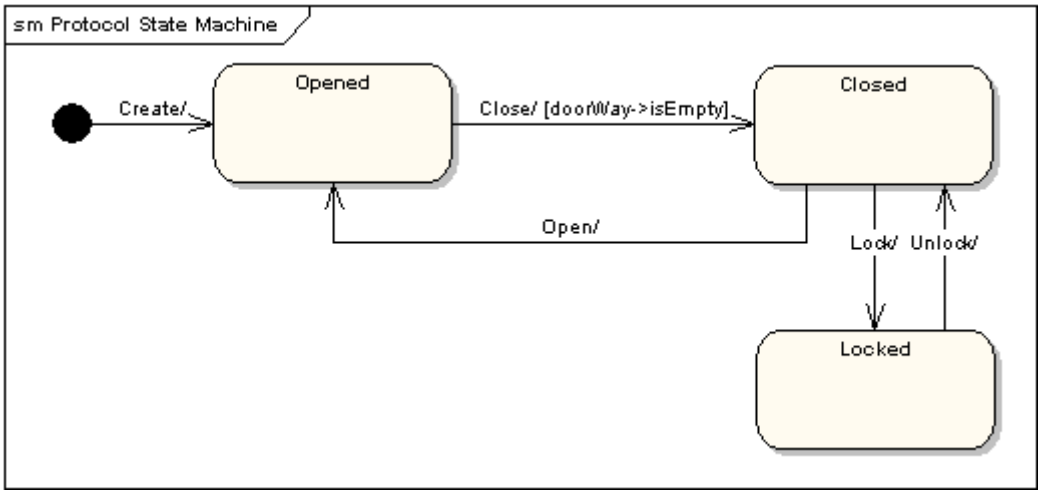
(ii) A *State Transition* represents a change from an originating state to a successor state.

(iii) An *action* can accompany a *state transition.*

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

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

22) Consider the following state diagram and the given statements.



(i) According to the above state diagram, the door can be in one of three states: "Opened", "Closed" or "Locked" and it can respond to the events Open, Close, Lock and Unlock.

(ii) If a door is opened, you cannot lock it until you close it.

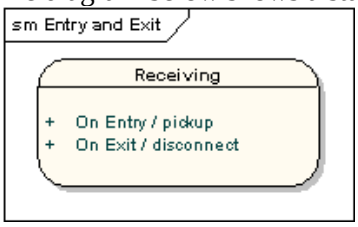
(iii) If the door is Opened, it can only respond to the Closed event if the condition doorWay->isEmpty is fulfilled.

Which of the above statements is/are correct according to the given diagram?

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

23) Consider the following statements related to *State* diagrams.

(i) The diagram below shows a state with an entry action and an exit action.



(ii) States are model elements that represent independent, interchangeable parts of a system.

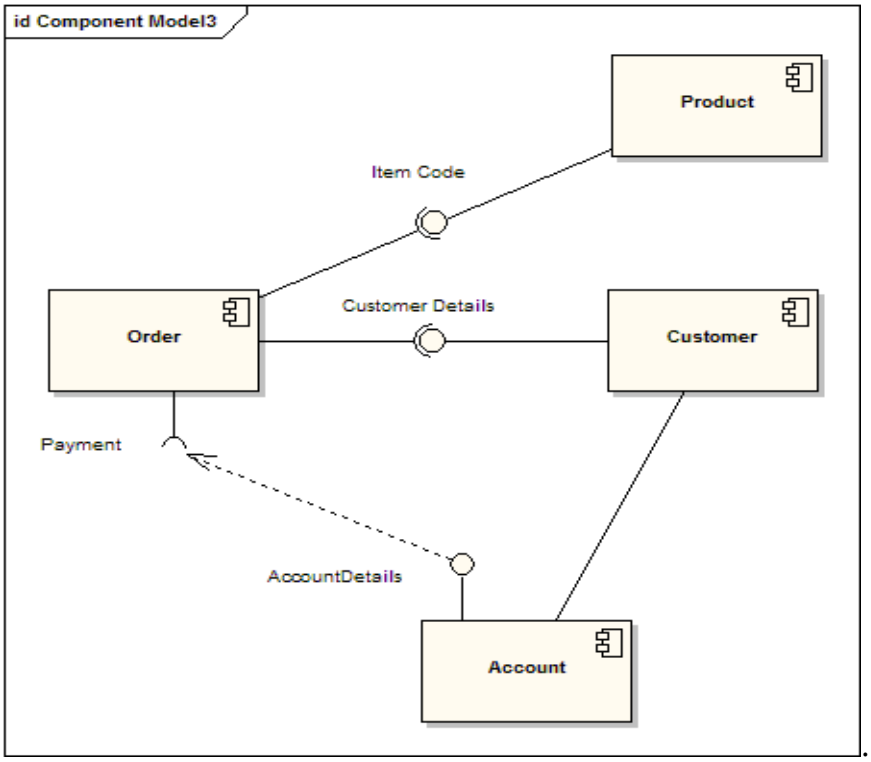
(iii) A state can have a transition that returns to itself, which is most useful when an effect is associated with the transition.

Which of the above statements is/are correct ?

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

24)

Consider the following diagram and the given statements.



(i) The diagram above demonstrates some components and their inter-relationships.
(ii) Assembly connectors "link" the required interfaces supplied by "Product" and "Customer" to the provided interfaces specified by "Order".
(iii) A dependency relationship maps a customer's associated account details to the required interface "Payment", indicated by "Order".
Which of the above statement(s) is/are correct?

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

25)

Which of the following is/are correct regarding Object Oriented Design (OOD)?

(a) An important initial part of the design is to examine several design strategies or alternative solutions and decide which will be used to build the system.
(b) The design includes activities such as designing the user interface, system inputs, and system outputs, which involve how the user interacts with the system.
(c) Before we evolve our analysis representations into design representations, we need to verify but not validate the current set of analysis models to ensure that they faithfully represent the problem domain under consideration.
(d) We must ensure that all the activity diagrams, use-case descriptions, and use case diagrams describe the same functional requirements.
(e) We need to check whether the transitions on a behavioral state machine are associated with operations contained in a class diagram.

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