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# B.Tech DEGREE EXAMINATION, NOVEMBER 2023

Third Semester

## 18CSC202J - OBJECT ORIENTED DESIGN AND PROGRAMMING

*(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)*

**Note:**

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

**Time: 3 Hours** **Max. Marks: 100**

**PART - A (20 × 1 = 20 Marks)** — Answer **all** Questions

| | | Marks | BL | CO |
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| 1. | What does a copy constructor do?<br>(A) It enables the transfer of data from one object to another.<br>(B) It checks whether two objects are equal or not.<br>(C) It is used to initialize an object with the values of another object.<br>(D) It terminates other copies of a specified object. | 1 | 1 | 1 |
| 2. | Which is used to define the member of a class externally?<br>(A) :<br>(B) #<br>(C) ::<br>(D) $ | 1 | 1 | 1 |
| 3. | Among the UML diagrams listed below, which one provides a static view?<br>(A) State chart<br>(B) Activity<br>(C) Collaboration<br>(D) Use case | 1 | 2 | 1 |
| 4. | What is the primary purpose of a constructor in classes?<br>(A) To modify the+ data whenever required<br>(B) To destroy an object<br>(C) To call private functions from the outer world<br>(D) To initialize the data members of an object when it is created | 1 | 2 | 1 |
| 5. | Which of the following is a valid example of a binary operator?<br>(A) +<br>(B) —<br>(C) ++<br>(D) Dereferencing operator (*) | 1 | 1 | 2 |
| 6. | What is the accurate statement regarding operator overloading?<br>(A) Only arithmetic operators can be overloaded<br>(B) Overloading doesn't change the associativity and precedence of the operators<br>(C) Only non-arithmetic operators can be overloaded<br>(D) Overloading alters the precedence of operators | 1 | 2 | 2 |
| 7. | What defines a lifeline in UML?<br>(A) It is a frame composed of a rectangle with a pentagon in its upper left-hand corner.<br>(B) It is a name compartment, where the interaction is depicted inside the rectangle.<br>(C) It is a rectangle with an identifier and a dashed line extending beneath it.<br>(D) It is a circle, which ensures connectivity with other components | 1 | 1 | 2 |

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| 8. | If a class is privately derived from a base class, then _____<br>(A) no members of the base class are inherited<br>(B) no derivation of the class results in an error<br>(C) all members are accessible by the derived class<br>(D) all the members are inherited by the class but are hidden and cannot be accessed | 1 | 1 | 2 |
| 9. | What is the most accurate description of hybrid inheritance?<br>(A) Combining the same type of inheritance<br>(B) Combining two or more inheritance types<br>(C) Inheriting from more than 7 classes<br>(D) Involving all types of inheritance | 1 | 1 | 3 |
| 10. | When single inheritance is employed with class A and B, with A as the base class, and class C, D, and E are involved, where C is the base class and D is derived from C, and E is derived from D, and class C inherits from class B, what is the resulting type?<br>(A) Multilevel<br>(B) Single level<br>(C) Hybrid<br>(D) Multiple | 1 | 2 | 3 |
| 11. | In C++, what is a pure virtual function?<br>(A) A virtual function defined in a base class<br>(B) Any function in a class<br>(C) A virtual function declared in a base class<br>(D) A function without a definition in a base class | 1 | 1 | 3 |
| 12. | How is an abstract class defined in C++?<br>(A) A class specifically used as a base class with at least one virtual function<br>(B) A class from which any other class is derived<br>(C) Any class in C++ can be considered an abstract class<br>(D) A class specifically used as a base class with at least one pure virtual function | 1 | 1 | 3 |
| 13. | What is a collection of model elements called?<br>(A) Box<br>(B) Package members<br>(C) Dependency<br>(D) UML packages | 1 | 1 | 4 |
| 14. | What is included in a component diagram?<br>(A) Components and their relationship to the environment<br>(B) Packages and dependencies<br>(C) Internal structure, components, and their relationship to the environment<br>(D) Internal structure | 1 | 1 | 4 |
| 15. | What is the approach for implementing exception handling in a C++ program?<br>(A) By using the Exception keyword<br>(B) By using Exception blocks<br>(C) By using Error handling schedules<br>(D) By using try-catch blocks | 1 | 1 | 4 |
| 16. | What type of program component is advisable to place within a try block?<br>(A) Components with dynamic memory allocation<br>(B) Components with static memory allocation<br>(C) Const references<br>(D) Pointers | 1 | 1 | 4 |
| 17. | What is the primary representation of vectors?<br>(A) Static arrays<br>(B) Dynamic arrays<br>(C) Stack<br>(D) Queue | 1 | 1 | 5 |
| 18. | In the declaration of a vector, which element is considered optional?<br>(A) Type<br>(B) Name<br>(C) Number of elements<br>(D) Vector | 1 | 1 | 5 |

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| 19. | Which container can have the same keys?<br>(A) map (B) unordered map<br>(C) set (D) multimap | 1 | 1 | 5 |
| 20. | What is the role of Iterators in STL ?<br>(A) They are STL components employed to reference memory addresses within a container<br>(B) They are STL components specifically designed for vectors<br>(C) They are STL components used for efficient function calls<br>(D) They are STL components utilized to establish template classes | 1 | 1 | 5 |

**PART - B (5 × 4 = 20 Marks)**

Answer **any 5** Questions

| | | Marks | BL | CO |
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| 21. | Create a C++ class "Student" with name, age, and an array to store exam scores. Implement methods to calculate the average score and display the student's information. Demonstrate by creating an object, inputting scores, calculating the average, and displaying the info. | 4 | 3 | 1 |
| 22. | Define a C++ class "Vehicle" with private attributes speed and fuel, protected methods to calculate efficiency, and a public method to display information. Create a derived class "Car" inheriting from "Vehicle" and explain the significance of access specifiers in data hiding and inheritance. | 4 | 2 | 1 |
| 23. | Explain the concepts of default and parameterized constructors in C++. How do these constructors differ in their role and usage in object initialization and what is their significance? | 4 | 2 | 2 |
| 24. | Define a C++ class "Rectangle" with length and width attributes. Create an inline function to calculate the area and a friend function to double the dimensions. Demonstrate by creating an object, doubling its dimensions using the friend function, and calculating the area with the inline function. | 4 | 2 | 3 |
| 25. | Explain the concept and purpose of pure virtual functions in C++. How do they differ from regular virtual functions, and what is their significance in object-oriented programming? | 4 | 2 | 3 |
| 26. | Create a simplified UML package diagram to represent a software application with three packages: "User Interface," "Database," and "Logic." Provide a brief explanation of the purpose of each package and how they relate to each other. | 4 | 3 | 4 |
| 27. | Discuss the fundamental algorithms available in the C++ STL, specifically focusing on find(), count(), sort(), search(), and merge(). Explain when and how these algorithms are applied, and give a concise code snippet for each algorithm. | 4 | 2 | 5 |

**PART - C (5 × 12 = 60 Marks)**

Answer **all** Questions

| | Marks | BL | CO |
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| 28. | (a) Create a C++ class called "Customer" to manage customer information. The class should have private attributes for "name," "email," and "customerID." Implement the following:<br>1. A parameterized constructor to initialize these attributes.<br>2. A copy constructor.<br>3. A destructor to display a farewell message when an object is destroyed.<br>4. A display method to show the customer's information.<br>Demonstrate the use of this class by creating multiple "Customer" objects, copying one object to another, and ensuring that the destructor is called for each object. | 12 | 3 | 1 |
| | **(OR)** | | | |
| | (b) Imagine you are designing a banking system. Create a UML use case diagram for this system that includes the following actors and use cases:<br>Actors:<br>1. Customer<br>2. Bank Teller<br>3. ATM<br>Use Cases:<br>1. Register for Online Banking<br>2. Log In<br>3. Withdraw Money<br>4. Deposit Money<br>5. Transfer Money<br>6. Check Account Balance<br>7. View Transaction History<br>8. Request Account Statement<br>9. Report Lost Card<br>Include appropriate associations, relationships, and dependencies between actors and use cases, and use proper notations such as includes, extends, and generalization as needed. Additionally, provide a brief description for each use case to explain its functionality. | | | |
| 29. | (a) Develop a C++ class, "MathOperations," that overloads operators for addition, subtraction, and multiplication and overloads methods for division and exponentiation. Include a real-world scenario that demonstrates the use of these overloads and elaborate on how they enhance code readability and reusability in your response. | 12 | 3 | 2 |
| | **(OR)** | | | |
| | (b) Create UML sequence and collaboration diagrams for a movie ticket booking system. Illustrate the interaction sequence between the Customer and the Booking System, and provide a more abstract view of object collaborations. | | | |
| 30. | (a) Explain the concepts of single inheritance, multiple inheritance, and multilevel inheritance in C++. Provide examples of real-world scenarios where each type of inheritance would be appropriate, and discuss the advantages and disadvantages of using each in software development. | 12 | 3 | 3 |
| | **(OR)** | | | |
| | (b) You're tasked with modeling the workflow of an online order processing system for an e-commerce platform. Create UML activity diagrams to illustrate the sequence of activities and decisions involved in order processing. Simultaneously, design UML state chart diagrams to represent the various states an order can be in, along with transitions. Include elements such as "Customer," "Order," "Order Processing System," and "Shipment." Explain how these diagrams assist in modeling the order processing system and ensuring efficient order management.' | | | |

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| 31. | (a) Design a C++ program for a "BankAccount" class, implementing exception handling using try, catch, and throw to manage scenarios like insufficient funds and invalid withdrawals. Explain how these constructs enhance the reliability and security of the banking system. | 12 | 3 | 4 |
| | **(OR)** | | | |
| | (b) Design UML component and deployment diagrams for a complex web-based e-learning application, illustrating component dependencies and the physical distribution of components on nodes. Explain how these diagrams aid in understanding system architecture, interactions, and deployment considerations, ensuring scalability and performance. | | | |
| 32. | (a) Explain the key characteristics and use cases of the STL sequence containers, focusing on Vector, List, and Deque. Provide code examples to illustrate their usage in real-world scenarios. | 12 | 3 | 5 |
| | **(OR)** | | | |
| | (b) Delve into file handling in C++, covering the reading and writing of data from/to disk files. Explain the significance of proper error handling in file operations, and provide code examples to demonstrate these concepts. | | | |

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