

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc
BRANCH: MATHS & COMP.

SEMESTER : IV
SESSION : SP/2024

SUBJECT: CS204 OBJECT ORIENTED PROGRAMMING AND DESIGN PATTERN

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
-

- | | CO | BL |
|---|----|----|
| Q.1(a) What do you understand by mutable and immutable objects? Why are strings in java is immutable? Discuss with a suitable example. [5] | 1 | 1 |
| Q.1(b) A retail store is maintaining their customer details such as customer id and name, mobile number, and address. They have decided to introduce a preferred customer plan for the existing customer. Any customer is given the status of preferred customer if they have made purchases more than 10 times. Preferred customers earn discounts based on their cumulative purchase amount as follows:
Cumulative Purchase Amount Discount (%)
>= Rs. 5000 1
>= Rs 10,000 2
>= Rs 15000 3
>= Rs 20000 4
Design an OOP model and implement it using java program. Refer the declaration of classes and application program to do the design. The program must get the details, compute bill amount, and print details both for ordinary and preferred customers. For example, if a preferred customer makes three purchases of amounts 3000, 7000, 8000 then the amount to be paid for each bill is 3000, 6860 and 7760 and the total amount to be paid is 17620. [5] | 2 | 2 |
| Q.2(a) With a suitable example explain the shadow variable and method argument shadowing. What is the difference between
i) Method overriding and method hiding
ii) Static method and instance method [5] | | 4 |
| Q.2(b) Let A be array of n integers. An array B is said to be a subsequence of an array A if the elements of B occur in A in the same order as in B but not necessarily contiguous. Additionally, the element belonging to $B \cap A$ should be a sub sequence. Given two arrays A and B ($ B \leq A $) of integers, write a program in java to check if B is a subsequence of array A. For example, if the values of A are 3, 7, 5, 9, 6, 1, 2 and the entries of B are 4,7,9,1. B is a subsequence of A because 7,9,1 is a sequence of B that occurs in the same order as in A. Also, the intersection of A and B is exactly 7,9,1. If $B = \{6,7,9,1\}$ then B is not a subsequence of A violating the property of $A \cap B$. [5] | | 3 |
| Q.3(a) What do you understand by dynamic method dispatch and initializer block? Explain with an example. What is the order of execution of initializer block and constructors. [5] | | 1 |
| Q.3(b) Consider a class named Shape3D that has abstract methods calculateVolume() and calculateSurfaceArea(). Create subclasses Sphere and Cube that extend the Shape3D class and implement the respective methods to calculate the volume and surface area of each shape. Take the required parameter for the calculation by user in the respective constructor of the class and initialize them using this keyword. The volume of the Sphere is computed using $(4/3)\pi \times \text{radius}^3$ and area is computed as $4\pi \times \text{radius}^2$. For Cube the volume is computed using edge^3 and area by using $6 \times \text{edge}^2$. Create 3 objects of each class and later two of them from each must be collected by Garbage Collector. Make the required changes in the program and display the removal of the object. Write the program in suitable try and catch block to handle different type of exception that might generate using user defined exception.
How can the object of a class be prevented from garbage collection when it comes to memory? [5] | | 6 |

- | | | | | |
|--------|--|-----|---|---|
| Q.4(a) | Describe any two GUI component along with the EventType, EventType and Method associated with the component. | [5] | 3 | 1 |
| Q.4(b) | Differentiate the chained exception and exception propagation with a suitable program. Consider a scenario that consists of list of integers, entered by user, and find out duplicate integer if any. The program will throw a user defined exception if any duplicate element exist in the list. | [5] | 4 | 3 |
| Q.5(a) | Generate boarding pass for the passengers of a ship which starts from Ranchi to Delhi. The boarding pass must be generated automatically with a pass number that begins with "RA" and followed by a number that is automatically incremented from value 'x', details like passenger name, age, mobile number, address, date of journey and fare. There is a seasonal discount based on the age of the passengers. A member function called discount which calculates the discount in the fare for the passenger with the following discounts. For the age group 'between 12 and 58, both inclusive' there is 20% discount in the fare, for the age group 'above 58', there is 40% discount and for the children (age under 12), 50% discount. Write a program in java to implement the above-mentioned scenario. | [5] | 4 | 3 |
| Q.5(b) | Explain the lifecycle of a Thread in Java with a proper diagram. What is the significance of yield() and join() method? | [5] | 5 | 4 |

::::::24/04/2024::::::M