

BE in INFORMATION TECHNOLOGY

2ND YEAR, 2ND SEMESTER EXAMINATION, 2022

OBJECT ORIENTED SYSTEMS

Full marks: 100

Total Time: 3 hours

PART A

[50 MARKS]

<p>CO1 [25 MARKS]</p>	<p>1. a) Justify the truth or falsity of the following statements with supporting arguments. Provide code snippet/s where/ if necessary.</p> <p>i. A non-static member method of a class can access only the non-static member variables. ii. A static block of a class is executed every time an object of the class is created. iii. Arrays are reference data types in Java whereas int, float, char are primitive datatypes. iv. The <i>main()</i> method of a class cannot be overloaded. v. An initialization block of a class can initialize both static and non-static variables of that class. vi. A class and its object occupy same amount of spaces in memory.</p> <p>b) State with valid reasons which pair of methods among the following can be overloaded. i. <i>public int sum(int, int)</i> and <i>public static int sum(int, int)</i> ii. <i>public void sum(int, int)</i> and <i>public void sum(int, int, int)</i> iii. <i>public int sum(int, int)</i> and <i>public void sum(int, int)</i> iv. <i>public double sum(float, double)</i> and <i>public float sum(double, float)</i></p> <p>c) Show how several member methods of a class can be invoked in cascaded fashion. Use suitable code to illustrate.</p> <p>d) What do you mean by anonymous object in Java? Illustrate cascading method call in relation to it.</p> <p>e) Consider a StringBuffer object created as follows. Now discuss the output after each of the following statements is executed.</p> <pre>StringBuffer s=new StringBuffer("JU IT OOS"); s.ensureCapacity(30); System.out.println("Capacity="+s.capacity()+"Length="+s.length()); s.append("2nd year"); s.insert(2, "2nd sem"); s.replace(5, 8, "Java");</pre> <p style="text-align: right;">[(2x6)+3+2+(2+1)+5=25]</p> <p style="text-align: center;">Or,</p> <p>2. a) Distinguish the functionalities between <i>throw</i> and <i>throws</i> keyword with suitable code. Provide a scenario where both of them can be used in a combined way.</p> <p>b) "Any member method in a <i>Base</i> class while overridden in <i>Child</i> class should be given more strict access specifier." Justify the validity of the statement. Provide suitable code, if necessary, to illustrate.</p>
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	<p>c) Fill up the blanks of the following statements with suitable set of phrases.</p> <p>A try block may be followed by _____ catch block/s. A try-catch block may be followed by _____ finally block/s. A _____ member method of a Base class is restricted to be overridden in its Child class. A String is _____ data type while a StringBuffer is _____ data type. Method overriding is also known as _____ binding. An abstract class in Java may have _____ abstract method/s. Any method of an interface must be redefined in the Child class with access specifier _____ A class can extend _____ number of class/es and _____ number of interface/s.</p> <p>d) Assume there are 5 managers and 15 clerks in a small organization. Create a class "Employee" having a private member variable <i>basic_sal</i> and an abstract member method <i>getSalary()</i>. Define suitable constructor of this class to initialize <i>basic_sal</i>. Now inherit this class to create another two classes "Manager" and "Clerk" with their own data members and necessary constructors. Assuming the "Manager" and "Clerk" get 40% and 20% dearness allowances respectively and 35% and 15% house rent allowances respectively over the <i>basic_sal</i>, override the method <i>getSalary()</i> within the inherited classes to find the total amount of money required to disburse the salary of all the employees per month.</p> <p>e) How can you restrict a class of a package from being imported? Without importing a package, how can you inherit a particular class of a package? Discuss the advantage of static importing a package with valid code snippet. If two packages p1 and p2 each having a class A are imported in a source file, then what problem is created? How this problem can be eliminated?</p> <p style="text-align: right;">[3+3+(0.5x10)+6+(2+1+3+2)=25]</p>
<p>CO2</p> <p>[25 MARKS]</p>	<p>3. a) Consider the following code snippet. Point out the problem/s and state how to solve.</p> <pre>Scanner sc=new Scanner(System.in); int a=sc.nextInt(); System.out.println("a="+a); String s=sc.nextLine(); System.out.println("s="+s); char ch=sc.nextChar(); System.out.println("ch="+ch);</pre> <p>b) Write a Java class having a method that will open a text file in read mode, select all the words containing atmost one vowel and write them into another file. Take the input of the source and destination file names from command line arguments.</p> <p>c) What is the drawback of creating a thread extending the <i>Thread</i> class? State how this drawback can be overcome. Show how the execution of a thread can be started?</p> <p>d) Discuss when synchronized block is better to use than a synchronized method.</p> <p>e) State the functionalities of <i>sleep()</i>, <i>join()</i>, <i>wait()</i> and <i>notify()</i> methods. Provide all the overloaded versions of each of the methods, if any.</p> <p style="text-align: right;">[4+6+(2+2+2)+3+(4+2)=25]</p>

PART B
[50 MARKS]

<p>CO3 [25 MARKS]</p>	<p>4. a) Write suitable code snippet to invoke the <i>length()</i>, <i>charAt()</i> and <i>indexOf()</i> methods of String class using reflection. Illustrate their functionalities with suitable examples.</p> <p>b) Use suitable code snippet to show how to access/invoke the forbidden methods of a class using reflection. Also show (with snippet) how a final field of a class can be modified.</p> <p>c) Define a generic class with a member method <i>sorting(A,P)</i> that take arrays A of different datatypes (int, float, char) as input and sorts it in ascending order. Now define another method <i>find(A,P)</i> that checks whether the element P is present (and at what position) within the sorted array A or not using binary search technique.</p> <p>d) Define a generic class <i>Sample</i> with two member variables of different types. Illustrate constructor overloading in relation to the class that initialize the data members with different values. Show how these constructors can be invoked. Also show how one constructor of this class can be invoked from the body of another constructor.</p> <p style="text-align: right;">[(3+3)+(3+2)+(5+5)+(3+1)=25]</p>
<p>CO4 [15 MARKS]</p>	<p>5. a) Distinguish between <i>include</i> and <i>extend</i> relation of a use case diagram with suitable examples.</p> <p>b) Show how the various components of a class are represented in a class diagram. What is multiplicity?</p> <p>c) Distinguish between aggregation and composition relation of a class diagram with proper examples. Show how inheritance is indicated in a class diagram.</p> <p style="text-align: right;">[5+(3+2)+(3+2)=15]</p>
<p>CO5 [10 MARKS]</p>	<p>6. a) Discuss the essential elements of design pattern. b) Explain command pattern with suitable examples.</p> <p style="text-align: right;">[3+7=10]</p> <p style="text-align: center;">Or,</p> <p>7. a) Explain Iterator pattern with proper examples. b) Discuss singleton design pattern.</p> <p style="text-align: right;">[5+5=10]</p>

Course Outcomes:

CO1: Differentiate different object oriented programming language and Solve problems by developing Java programs using (i) classes, (ii) inheritance, (iii) nested classes and (iv) exceptions.

CO2: Solve problems using thread programming and Input-Output.

CO3: Develop programs using advanced programming paradigms: (i) Introspection capabilities, (ii) Generic Programming.

CO4: Model and Sketch software systems by using different artifacts of Unified Modeling Language.

CO5: Explain and illustrate basics of design patterns by developing programs.