

B.E. COMPUTER SCIENCE AND ENGINEERING
SECOND YEAR SECOND SEMESTER EXAMINATION 2025
ADVANCED OBJECT ORIENTED PROGRAMMING

Time: 3 hours

Full Marks : 100

Use separate answer scripts for PART-I and II

PART-I (Java)

[CO1 Conceptualize the object oriented features of Java and Python]

Answer ANY TWO

20marks

1. Define a class for integer matrix operations. Store the user inputs into an $m \times n$ array. Display the matrix. Calculate the sum of elements of the upper triangular matrix. This calculation should not be visible outside the class. Display the result of the summation from main method. Also provide a utility method for the class that calculates the sum of the border elements of a matrix. 10
2. (a) How are call by value and call by reference implemented in Java?
(b) Suppose there is a user defined class STUDENT with roll, name and score as attributes. Objects are to be stored in a binary file. Design the necessary class for that. Write down the code in Java to display all the objects from the file. 4+6=10
3. (a) Write a program in Java to store the words and their frequencies from a given sentence taken from command line without using collections framework.
(b) Every bank account holds an account no, customer name, and a calculateInterest method. A customer can have a "SavingsAccount" and/or a "CurrentAccount". Different accounts can have different interest rates. A customer can have maximum 1 savings and 1 current account. User should be able to display all accounts. Design the classes and implement appropriate objects in the main method. 4+6=10

[CO2 Understand and Develop concurrent programming in Java and Python]

Answer ANY ONE

10marks

4. (a) Create a PrimeThread class that can sum prime numbers ranging between two given inputs *left* and *right*. Write the main class where you create 3 such PrimeThread objects to sum prime numbers from 1 to 10,000 in parallel. Hence, set the values of *left* and *right* appropriately for the 3 thread objects. Create threads here by implementing Runnable interface.
(b) What is the significance of join() method? 8+2=10
5. (a) What is the specialty of a Thread object that it executes parallelly while other objects are not?
(b) You are asked to create a message wall. Anybody can read the wall parallelly but when you are writing on it, all others should wait for the modification to finish. So, the waiting threads would display a suitable message to indicate that it is waiting for the update to finish. 2+8=10

[Turn over

[CO3 Understand and Develop event driven programming in Java and Python] 5marks

6. (a) Write suitable code snippet to show the role of behavior parameterization in GUI programming.
 (b) Why does a Swing task not run on the main thread? 3+2=5

[CO4 Design and implement object oriented solution for problems using Java and Python] 15marks

Answer ANY ONE

7. (a) Read a piece of text from a *file* and construct an array out of the words you read. Now find anagrams in it and group them, Write a method to display all the anagram groups. You can use Collection framework. Use *try with resources* construct. Use of *throws* is not allowed.
 Anagrams contain the same alphabets rearranged in different orders such as, “lamp” and “palm”.
 (b) How does the collection classes in Java get an iterator to traverse through the respective collection? Which object-oriented properties have been utilized here by the Collection framework?
 (c) How can you combine multiple catch blocks? 10+3+2=15
8. (a) Construct a binary tree representing the names of different buildings of the campus. The adjoining buildings have a direct edge among them. The users will be given such a structure. Given the root of such a *JU Campus Tree*, return *all root-to-leaf paths in any order*. A leaf is a node with no children. Treat a node as an inner class.
 (b) In a two dimensional array of integers number of columns may vary across the rows. Write down the code snippet to implement the array and to show the number of columns in each row.
 (c) Ordering of all types of initializers (not constructors) are important. –Comment on it. 10+3+2=15

PART-II (Python)

Answer all questions

[CO1 Conceptualize the object oriented features of Java and Python]

1. Answer any 2 questions- 5+5=10 [CO1]
- Can range() function be used to generate numbers from 0.1 to 1.0 in steps of 0.1?
 - Discuss the following methods associated with the file object
 a) read() b) readline() c) readlines() d) seek() e) write().
 - How does Generalization differ from Encapsulation. Explain with examples in Python.
 - Why should break and continue be always used with an if embedded in a while or for loop?
 - Write a Python program to generate all Pythagorean Triplets with side length less than or equal to 30.

2. Demonstrate in Python how to create simple and multi-line strings and whether a string can change after creation. Also show the usage of built-in functions len(), min() and max() on a string. 10 [CO1]

or

Discuss advantages of Python over Java as an Object Oriented Programming Language. 10 [CO1]

[CO2 Understand and Develop concurrent programming in Java and Python]

3. Write a Python program to design a simple connectionless server, explaining the connectionless service. 10[CO2]

Or

Write a program in Python that prints the following 3 messages through 3 different threads:

[What is this life...]

[We have no time...]

[To stand and stare!]

Each thread should be passed the relevant message and should print '[' , message ans ']' through three different calls. 5+5=10 [CO2]

[CO3 Understand and Develop event driven programming in Java and Python]

3. Create a GUI application in Python that provides an Entry field where the user can provide the name of a text file. Open the file and read it, displaying its contents in a Label. You can also replace the Entry widget with menu that has a File Open option that pops up a window to allow the user to specify the file to read. Also add an Exit or Quit option to the menu rather than having a QUIT button. 10

[CO3]

Or

Compare Object-oriented programming and Event driven programming. What are the advantages of Event-driven programming. 5+5=10 [CO3]

[CO4 Design and implement object oriented solution for problems using Java and Python]

5. Create a list of tuples. Each tuple should contain an item and its price in float. Write a program in Python to sort the tuples in descending order by price. Use operator.itemgetter(). 10 [CO4]

or

Write first seven Fibonacci numbers using generator next function/ yield with a class in Python. Trace and memorize the function.

10 [CO4]