Ref. No. Ex/CSE/PC/B/T/214/2024(S)

BCSE 2nd Year 1st Semester Supplementary Examination, 2024

Programming Fundamentals and Object Oriented Concepts

Full marks: 100 **Time: 3 hours**

Attempt any five questions

1) a) In the main() function of a C program, declare a 2D array to store the marks of all students (maximum 100 students) in all subjects (maximum 5 subjects). Write a function to take actual number of students and subjects from the user. Write a separate function to read and store the marks in the array. Write another function to display the total score for each student. Write the complete code in C. 10

b) Define a structure to store roll, name and percentage score of a student. Write a function to create an array of structure to store information of the students dynamically by taking the number of students during runtime. Write another function to show the name of the students with score more than or equal to 70%. Write the complete code in C. 10

2) a) A student file (binary and fixed length record) contains roll, name score (integer ranging from 0 to 100) for all the students. Assume that the file exists. Write the code in C to find the number of students with score less than 50, >=50 and <60, >=60 and <70, >=70 and <80, >=80 and <90, >=90. 10

b) i) Mention the advantages and disadvantages of using a function? 3

ii) Compare a pointer and reference variable in C++. 3

iii) Explain fwrite() and fprintf() in C and also compare. 4

3) a) An institute maintains a list of curriculums that it offers. Each curriculum has id (it is unique), name and a list of subjects taught. Each subject has unique code, name and type (theory/practical). Same subject may be offered in multiple curriculums. The system must be able to find the theory subjects taught in a curriculum (against curriculum id provided by the user), practical papers in a curriculum (against curriculum id provided by user), curriculums in which a particular subject is taught(against subject code provided by the user), curriculums offered by the institutes.

Design the classes. Code is not required. Provide prototype of the methods and brief textual description. Clearly indicate if one method makes use of another and how the mentioned outcomes are met. 10

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b) i) Comment on the use of public data member and private member function in a class. 3
ii) What is the utility of a static data member and static member function? 4
iii) What is a friend function? 3

4) a) i) Compare function overloading and function overriding in C++. 3

ii) Describe the accessibility of the members of a base class in derived class. 4

iii) Why do we need virtual base class? 3

b) For each student roll, name and marks are to be stored in a file. Design and implement (code required) the class(es) in C++ to support the following:

details of the student (for a roll number given by user) can be displayed, a record can be added (provided, the roll is already not there in the file). 10

5) a) i) Describe the role of constructor and destructor. 4
ii) How will you achieve runtime polymorphism? 4
iii) How will you define an abstract class? 2

b) Design and implement a generic class in C++ that can store and work with an array of numeric elements. Size may be defined at the time of object creation. One should be able to find the largest value in the array. If X is an object then cout << X will print all the elements.

Now, suppose I want to have of array of student objects using the generic class. Each student has roll and score. In this case, finding largest value means finding the object with highest score. What measures (no code is required) will you take so that the same generic class can be used? 6+4

6) a) Compare using declaration and using directive in namespace? 4

b) Each student has roll, name and score. Store data for the students of a batch, sort them in the descending order of score and display the information of all the students. Design and implement the classes. Use suitable STL class. 6

b) Write short notes on container, iterator and generic algorithm in STL of C++? 10

7) Write short notes on the following.

a) Data encapsulation and abstraction 4

b) Exception handling in C++ 4

c) Copy constructor in C++ 3

d) Hashmap in C++ STL 5

e) Parameter passing in C 4