

BCSE 2nd Year 1st Semester Examination, 2025**Programming Fundamentals and Object Oriented Concepts**

Full marks: 100

Time: 3 hours

Group A [CO1]: 15 Marks

- 1) a) What are the advantage(s) and disadvantage(s) of using an array? 3
- b) X is a 2-D array of integer. What is the difference between $(x+i)$ and $x[i]$ where i is an integer? 2
- c) Declare a pointer to an array. Using the same implement 2D array in C and specify the number of rows and columns of the implemented array. 3
- d) Declare an array where the elements will store roll and score in five subjects of the students. Maximum number of students is 100. Write a **function in C** with suitable arguments to print the highest aggregate score. 4
- e) Consider a structure EMP that contains employee code, name, designation, salary, department of an employee. **Design a function** in C language (only prototype is required) to sort the array of structure. Design will be such that a user will be able to use the function to sort on the basis of desired field like; employee code / salary / designation / department and in ascending or order descending order (do not consider fieldname/sorting order as arguments). 3

Group B [CO2]: 10 Marks

- 2) An organization maintains a stock file that keeps item code (unique), item name, quantity in stock and price. Assume, stock file is a binary file with fixed length records and records are placed in sorted order on item code. Item codes are integer (sequential numbers starting at 1). Stock file already exists. Now, write the functions in C language for the following:

Create a suitable file and store information of daily transactions. For each transactions keep item code, transaction quantity and transaction type ('S' denotes sale, 'R' denotes receive). If the transaction is of sale type then check quantity in stock is not less than transaction quantity. For each transaction, quantity in stock is to be updated (sale will reduce it and receive will increase).

10

[Turn over

Group C [CO3]: 30 Marks

Attempt any three

- 3) a) `int x=5; int & y=x; y++; int z=10; y=z; y++;`
 What will be values of x,y and z? Explain your answer. 2
- b) Comment on the use of private member function in a class 3
- c) Specify the ways so that member function of a class can access the private members of another class. 3
- d) How will you convert a base class object into a derived class object? Assume you have no access to the source code of base class. 2
- 4) a) An object of a class may not have its own copy of certain members visible in the class definition and can have the copies of certain attributes not visible in class definition. Explain. 5
- b) What is the utility of an abstract class? 2
- c) Describe a scenario when we should write our own copy constructor. Also write the prototype of such constructor. 3
- 5) a) Mention the utility of static members in a class. 4
- b) Compare function overloading and function overriding in C++. 3
- c) Consider X and Y are objects of Sample class. An operator+ function is there in the class to add two objects and it returns another object. **Explain** what you will do (optimally) to support the following:
`X=5;`
`X=Y+5;`
`X=5+Y;` 3
- 6) a) A is the base class for B. In A, there is a public member function with prototype `void f(void)` and in B there is a public member function with prototype `void f(int)`. **Explain** what will happen for the following.
 i) `B x; x.f();` and ii) `A*p; B x; p=&x; p→f(10);` 4
- b) Why do we need a virtual destructor? 3
- c) Compare a normal function and an inline function. 3

Group D[CO4]: 30 Marks

Attempt any two

- 7) a) Consider a system that maintains a list of students. Each student has roll (unique), name, phone_no, email-id and status (whether currently in the department or not). List of departments are there where each department has dept code (unique), dept name and number of students in the department. The system will allow a student to join an

existing department or to leave the department. Given a roll, details of the student (if present) including the corresponding department are to be displayed. Given a dept code, system will be able to show the number of students in the department and also the details of the students. Design (with brief description) the necessary classes.

Design the classes. Detailed Code is not required. Provide the prototype of the methods and **brief textual description mentioning if one method calls another.** For simplicity, assume that lists are in memory, not in file. 10

b) Sample is a class with virtual function. Sample objects are to be stored in a file and objects are to be retrieved as and when required. Design the necessary classes with explanation. 5

8) In an organization, for each employee employee-id, name, phone number and e-mail id, basic pay, designation is stored. Employee may be permanent or contractual. For permanent employees provident fund is deducted from monthly salary which is certain percentage (fixed for all such employees) of their basic pay and dearness allowance is added which is certain percentage (fixed for all such employees) of their basic pay. For contractual employees a fixed amount of allowance (same for all such employees) is paid in each month. Permanent employees can take the loan. Corresponding to each such loan information like, loan date, loan amount, monthly installment amount, amount paid so far, date of clearance (once the loan is finally cleared) etc. are also to be maintained. Note that, such an employee can take loan multiple times. But at a point of time only one loan is active (i.e. yet to be cleared). Salary computation process for the employee takes care of basic pay and relevant allowances to be added along with the relevant deductions to compute the monthly pay. System will be able to show all the previous and ongoing loan (if any) information for a given employee id.

Design the classes. Detailed Code is not required. Provide the prototypes of the methods and **brief textual description mentioning if one method calls another.** For simplicity, assume that lists (if any) are in memory, not in file. 15

9) a) For each item information like, item code, item name, price, quantity in stock are to be stored in a file. One should be able to add new item with unique item code. Given an item code one can find the details of the item and one can modify the quantity in stock for a given item code. **Design the classes and implement (code in C++ is required).** 10

b) **Design and implement (code in C++ is required)** an array of integer with the features: its size (by default 0) can be specified at the time of object creation, an object can be declared and initialized by an existing object (both will have separate copies). 5

Group E [CO5]: 15 Marks

10) a) A function works with an 2D array. When accessing the array element, it checks whether array indices are within the limit or not. If not, then throws an exception and needs to throw the both the indices. How will you handle it? 3

b) Suppose, there is a function template and also an overloading function. How a call for the same will be resolved? 2

c) What is the use of namespace? 2

d) For each student roll, name and score are stored. Consider a STL container of your choice. Use suitable algorithm(s) available in STL i) to show the roll and name of the students with score more than a value given by user, ii) to sort the students in the descending order of the score. Design the class(s) and write the code. 8