BCSE 2nd Year 1st Semester Examination, 2023

Programming Fundamentals and Object Oriented Concepts

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

Group A [CO1]: 15 Marks
Attempt any one

1) a) For every student roll number, name and codes of the subjects he/she likes to study are to be stored. Subject codes are integer. Subjects of interest and number of such subjects may vary for different students. We want to have an array of student data. Number of students will be provided during runtime. Write a program in C for the scenario described along with two functions to store student data in the array and to display all the student data.   8

b) Declare a pointer to an array of 5 integers. Assign the pointer with a 10x10 array of integers. Increment the pointer. What does it represent now?   2

c) How will you pass a 2D array to a function?   2

d) Explain the use of pointer to function in C.   3

2) a) 16 teams are taking part in a tournament. Each team has unique team id (say, 1, 2, .. 16). Match is played between two teams. Number of matches played by the teams is not same and it is not known in advance. Each match has unique match id (say, 1, 2 …). Once a match is over, store match id, opponent team id and the outcome (whether corresponding team has won/lose or it's a tie) corresponding to each participating team in the match. Write a program in C to store the information in memory (not in file) and write a function to display the performance (number of matches played, number or matches won/lose/tied) for a team id given by user. Note, we need to store and access the information team wise.   10

b) Discuss the mechanisms for parameter passing to a function in C.   3

c) What is self referential structure in C?   2

Group B [CO2]: 15 Marks

3) a) Compare the files for the following cases: records are stored using fprintf() and records are stored using fwrite().   3

b) What is the utility of r+ mode of opening a file in C?   2

[Turn over

c) EMP file is there that contains employee code, name, basic pay and dept code for all the employees. Assume it is a binary file and all the records are of same size. The file exists and records are sorted on dept code. Write a program in C to print the dept code wise total basic pay for all the departments.   10

Group C [CO3]: 30 Marks
Attempt any two

4) a) Consider a class AAA as follows.

Class AAA

{ int x;

public:

void get(void) { cin>>x;}

void show(void) { cout<<"x="<<x<<"\n";}

};

What can you do with this class? Explain your answer.   4

c) What is the utility of abstract class? How will you define an abstract class?   4

d) What is the difference between the two cases: A is the base class for B and A is the virtual base class for B?   3

d) Compare a normal function, macro and inline function.   4

5) a) Consider **Internal_marks** is a class with two class test scores as private data members. **Semester_marks** is a class with semester score out of 100 as private data members. A global function has to be defined to compute final score as average class test score + 0.7*semester score. Discuss the mechanisms so that the global function can do the task and mention the corresponding supports that you need in the classes.   4

b) Why do we need a virtual destructor?   3

c) Consider A is a base class for class B. A member function of B works with a data element x. How x is resolved?   3

d) How can you convert a derived class object to base class object and vice versa? 3

e) What is the utility of exception handling?   2

6) a) Comment on the usage of public data member and private member function of a class.   4

b) Consider class A with the following public member functions:

   void f1(double),   virtual void f1(int),   virtual void f1(int, int),   void f1(char),
void f2(char, char)

   Class B has been publicly derived from class A and with the following public member functions:

   void f1(int),   void f1(char),   void f1(float),   void f1(int, float)

   Now, consider the following code snippet and **explain** the outcome of the function calls:

   int i, j; char c1, c2; float fx; double dx; A *p; B b; p=&b;

   I) b.f1(i,j); II) b.f2(i,j); III) p->f1(i,j); IV) p->f1(c1); V) p->f1(i); VI) p->f1(fx);

                                                                                                              9

c) How can you convert an object of a class to a basic data type?   2

Group D[CO4]: 25 Marks
Attempt Q. 7 and any one from Q.8 and Q. 9

7) Each item has item code, item name, base price and quantity available. A stock list contains information of all the items. Item may be of type "Essential"/ "Luxury"/"Normal". Following services are required from the system: i) add a new item in the stock list, ii) find the item details corresponding to an item code, iii) display the details of all the items, iv) sell an item. In case of a sell, along with the item code, quantity will be taken as input and it must not exceed available quantity. In case it exceeds sell is cancelled otherwise selling is allowed, quantity available has to be updated and payable amount has to be displayed. Payable amount is computed as follows. Base price * quantity will be the base amount. Sales tax (certain percentage of base amount) is added to base amount and this rate is fixed for all types of items. GST (another tax, computed as certain percentage of base amount) is further added and it is different for different types of items. For Luxury item additional luxury tax (certain percentage of base amount) is to be added. Provisions should be there to change the different tax rates.

Design the classes and implement (**Complete code is required. Do not consider any file/ STL classes**).   15

8) Bio-sketch of a job seeker will have the following:

Personal details consisting of name, address, e-mail and contact number

Academic details consisting of exam level (say, X, XII, UG etc.), specialization (like, Sc./ Commerce/Arts for XII, CSE, ETCE etc. for UG/PG Engg., similarly for others, if applicable), year of passing, percentage of marks/CGPA, Institute. It will have information for all exams cleared.

Skill details will contain programming languages known and tools conversant with.

Each bio-sketch is automatically assigned unique id of integer type. Support must be there to collect data, display personal details, get the contact number, display academic details and skill details, whether a candidate knows a particular programming language or conversant with a tool or not , whether have a minimum score at a specific exam level. Provision must there so that one can search for particular id in the list of bio-sketch.

Design the necessary class(es). 10

9) a) Class A has an integer, array of character as data members. It also has a static data member, a virtual member function. Discuss the issue in case we store the instances of A using write() method of C++. 3

b) Consider STUDENT is a class with roll, name and score as data members. Design the necessary class(es) and write down the code to store student objects in a file by ensuring the uniqueness of roll number. 7

Group E [CO5]: 15 Marks
Attempt Q. 10 and any one from Q.11 and Q. 12

10) a) What happens when an object is declared using a class template? 3

b) Discuss the use of namespace. 2

11) a) Student objects have roll, name and score. Store them in a suitable STL container. Write down the code using suitable algorithm and customizing the same to display the students with score greater than a user provided cut-off. 7

b) For a container to check whether it is empty or not one can use empty() or size() returning 0 or not. Compare the two techniques.

What is the difference between subscript operator and at()? 3

12) a) For allotment of projects students with higher marks will get the priority. Roll and score for the students are to be stored maintaining the priority order. What will you do? 3

b) Describe the insert() method for a map. 3

c) Let v be a vector of int. Explain what will be the outcome of sort(v.begin(), v.end(), greater<int>) 2

d) How will you specify the hash function for a hash map? 2