0038

National University of Computer and Emerging Sciences

FAST School of Computing — Spring 2022 — Islamabad Campus

CS-1004: Object Oriented Programming

Serial No:

Final Exam

Total Time: 1 Hour

Total Marks: 50

Monday, 14th March 2022

Course Instructors

Dr. Naveed Ahmad

_Signature of Invigilator

M. Yousaf	21L-1938	P	
Student Name	Roll No	Section	Signature

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. **Please read the paper carefully, set aside 10 minutes just to understand questions. Time every question and stick to it!**
2. No additional sheet will be provided for rough work. There are two pages for ***rough work*** provided at the end of the paper.
3. After asked to commence the exam, please verify that you have twelve (12) different printed pages including this title page. There are a total of three (3) questions.
4. Calculator sharing is strictly prohibited.
5. Smart device (of any sort) are not allowed.
6. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.

	Q-1	Q-2	Q-3	Total
Marks Obtained	3	[illegible]	3	6
Total Marks	14	16	20	50

Question 1 [14 Marks]

a) What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF10. (4 marks)

Code	Valid/Invalid - Justification

`int arr[]={5,9,12,14,72};`
`int *p2=arr;`
`for(int i=0; i<5;i++) {`
`  p2++;`
`  cout << *p2+i <<" ";`
`}`
	0XFF10 0XFF12 0XFF26

`int p1[]={5,9,12,14,72};`
`for(int i=0; i<5;i++)`
`  cout << *(p1+i) <<" ";`
	5 9 12 14 72

`char p1[]="Hello World";`
`for(int i=0; i<5;i++) {`
`  p1++;`
`  cout << *p1;`
`}`
	Hello
	0xFF10 0xFF11 0xFF12
	0xFF13 0xFF14.

`int arr[]={5,9,12,14,72};`
`int *p2=arr+5;`
`for(int i=0; i<5;i++) {`
`  p2--;`
`  cout << *p2+i <<" ";`
`}`
	0XFF14 0XFF14 0XFF14
	0XFF14

b) Given four single dimensional arrays of integers of same size. How can we use all of them by one name? Also use that for taking input from the user. You can allocate single variable from stack memory and minimum required memory from heap. Don't copy the values. Use same arrays. (5 marks)

Hint: In your code we should use single nested loop to take input in all four arrays.
int a[5]; 2 int b[5]; 3 int c[5]; 4 int d[5];

```
int b[][][][]
int a[4][4];
for (int i=0; i<4; i++)
  for (int j=0; i<4; j++)
    cin>> a[i][j];
```

c) Write the header of function ABC( ) for receiving 2D array in two different possible ways. Also, write the output for the below code. (1x3=3 marks)

Code:

```
void ABC(//parameter to receive 2D array)
{
      for(int i=0; i<5; i++)
      {
            for(int j=0; j<5; j++){
                  cout<<A[i][j];
            }
            cout<<endl;
      }
}

int main()
{
      int **A;
      A=new int*[5];
      for(int i=0; i<5; i++)
      {
            A[i]=new int[5];
            for(int j=0; j<5; j++){
                  A[i][j]=i+j;
            }
      }
      ABC(A);
      return 0;
}
```

Header no.1: int A[][5]

Header no.2: int **A

Output:

0 2 6 8 10

0 1 2 3 4 5
1 2 3 4 5 6
2 3 4 5 6 7
3 4 5 6 7 8
4 5 6 7 8 9

d) Write the output of the following programs. (2 marks)

Code	Output

```
int * ABC() {
      return &b;
}

int * DEF(int *p)
{
      return p;
}

int & DEF()
{
      return *p;
}

int & GHI()
{
      return a;
}

int main()
{
      int a=4;
      int *p;
      cout<<*(ABC());

      p=DEF(&::a);
      cout<<*p;

      DEF()=1;
      cout<<::a;

      a=GHI();
      cout<<a;

      return 0;
}
```

No memory location assigned

Question 2 [16 Marks]

Consider the following C++ code and answer the questions below.

a) Fill in the empty boxes to implement the function that enters data for all the students. (6 marks)

```
1  #include <iostream>
2
3  using namespace std;
4
5  struct Courses{
6      int cID;
7      string cCode;
8      int cHours;
9      float cScore;
10 };
11
12 struct Student{
13     char* sName;
14     int sRegID;
15     float sGPA;
16     Courses* sCourses;
17 };
18
19
20 void enterStudents( Student Std[] ){
21     string str;
22     if(i < N) {
23         cout << "Name: " << endl;
24         cin >> str;
25         std->sName = [ Str ];
26         std->sName = [ Str ];
27         cout << "Registration No. " << endl;
28         cin >> std->sRegID;
29         std->sGPA = 0.0;
30         int cr = 0;
31         cout << "Enter Courses " << endl;
32         cin >> cr;
33         std->sCourses = new Courses[cr];
34         //enterCourses( [          ] );
35
36         enterStudents(std, N, ++i);
37     }
38     cout << "Student No. " << i+1 << " data entered" << endl;
39     return;
40 }
41
42 int main(){
43
44     Student *std = new Student[20];
45
46     enterStudents( Std );
47
48
49     delete[] std;
50     return 0;
51 }
```

b) Write a function enterCourses similar to the function enterStudents (5 marks)

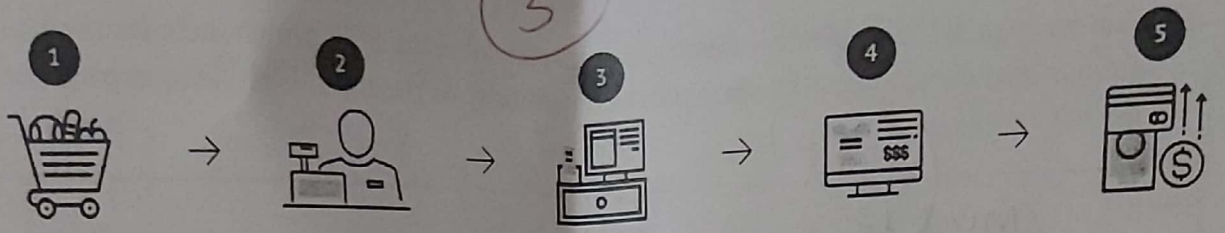
```
void enterCourses( student *Std1 ){//choose parameters carefully
String str;
if (i<N){
cout << "Name";
cin >> str;
(*std).Name = str;
(*std).Name = str;
cout << "RegNo";
cin >> (*std1).RegNo;
```

c) Write a recursive function that calculate GPA of a given student (5 marks)

```
void calcuateGPA(Student s ){//You can add any parameters
```

Question 3 [20 Marks]

You have to create a Point of Sales (POS) solution. Following diagram shows the working of a POS system.



3

You have to create this system using structure. Common feature of a POS are as follows:

- Sales and checkout
- Payment processing
- Inventory management
- Customer Relationship Management
- Reporting

Note: As discussed in lectures, prefer dynamic memory allocation wherever possible.

a) Identify the ***structure*** you will have to create to store the information. Is there any relationship between identified structures (example of a relationship is a structure nested within another structure). Draw a hierarchical diagram of identified structures. [3 marks]

struct Data {
double sales;
double payment;
int item.ID;
customer c;
int price
}

struct customer {
string name;
}

Product
Sales
Supplier

b) You are required to implement inventory management using POS which includes maintaining product data (prices, supplier and available quantities). Write the C++ code to implement this. [6 marks]

```
stdI
struct I{
  string name;
  int price;
  string supplier;
  int quant;
};
                    int Suplier_Id;
                    double Tot sales;

int main(){
  stdI S[];
  POS(S);
}
void POS(stdI S[]){
  cout<<"Enter your name";
  string arr[] = {"Ali","Yousuf","Ahmed"};
  for(int i=0;i<3;i++){
    S.supplier = arr[i];
    S.price = rand()%250+150;
    S.quant = rand()%10;
    S.Suplier_Id = i;
  }
}
```

c) You are required to implement sales and checkout which records each sales and also updates inventory. Write the C++ code to implement this. [6 marks]

```
struct sales{
    double sal;
};

struct S{
    struct sales sales[3];
};

int main(){
    int id;
    cout << "enter customer id";
    cin >> id;
    purchase(std1, id);
}

void purchase(std1 s[], int n);
for(int i=0; i<3; i++)
    if(std1.suplier_id == n)
        if(std1.prod_id == x){
            std1.sales[i].sal = std.price;
        }
}
```

d) Write a main function which keeps on running forever but triggers only whenever there is a new sale. Call the functions in appropriate order to setup POS (inventory) and sales functionality. [5 marks]

```
int main(){
for(int i=0; i<3; i++)
    for (int j=i+1; j<3; i++ ){
        if (std1.sales[i][i].sal == std[j].sal)
            goto line1;
        else
            cout << tot.sales;
```