Solution Paper

Course Code:CS1002	Course Name: Programming Fundamentals
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Student Roll No:	**Section:**

Instructions:

- Return the question paper and make sure to keep it inside your answer sheet.
- Read each question completely before answering it. There are **three questions and two pages (front plus back)**.
- In case of any ambiguity, you may make assumption. However, your assumption should not contradict any statement in the question paper.
- Do not write anything on the question paper (except your ID and group).

Total Time: 1 Hour   **Max Points**: 60

Question#1: Give the output when these programs are executed: **[12 points, CLO3, 15 mins]**

1.
```c
#include <stdio.h>
void main()
{ int data[] = {-2, 45, 0, 11, -9},i;
    for ( i=0; i <6 ; i++) {
        if (data[i] > data[i + 1]) {
          int temp = data[i];
           data[i] = data[i + 1];
           data[i + 1] = temp;
         }
      }
    for ( i = 0; i < 5; i++) {
        printf("%d ", data[i]);
        }
}
```

-2 0 11 -9 0

2.
```c
#include <stdio.h>
int main()
{
    char str[]="PFMIDII";
     int i;
   for(i = 0; str[i] != '\0'; i++)
   {
     str[i]=str[i]+i;
     printf("%c", str[i]);
   }
}
```

PGOLHNO

3.
```c
#include <stdio.h>
int main()
{  int i=0, j=0;
  do
  {
   while(j < 3)
   {
    printf("%d", j);
    j++;
     }
   printf("%d\n", ++i);
  }
  while(++i < 6);
  return 0;
}
```

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4.
```c
#include <stdio.h>
int main()
{  int i=1, j=0;
  do
  {
    for(j='A'; j<='E'; j+=i)
    {
       printf("%c",j );
       }
     i++;
     printf("\n");
  }
  while(i< 4);
  return 0;
}
```

ABCDE
ACE

3 5	AD

Question#2: [16 points, CLO2, 20 mins]

Scenario: Deoxyribonucleic acid (DNA) is an information carrier in humans' cells that helps in the development and functioning of an organism. The information in DNA is stored as a code made up of four chemical bases (letters) or nucleotides: adenine (A), guanine (G), cytosine (C), and thymine (T). Human DNA consists of about 3 billion bases, and more than 99 percent of those bases are the same in all people. The meaning of the DNA code lies in the sequence of these nucleotides' letters i.e. A, G, C & T.

Task:
Read a long DNA sequence up to 20 nucleotides and display a histogram of each letter by printing number of '*' against each letter.

Sample Input:
AGCTTACATATTACGAGTTG

Sample Output:
A: * * * * * *
G: * * * *
C: * * *
T: * * * * * * *

```
void main(){
int i=0;
char text[100];
int freq[92]={0};
printf("Enter any text:\n");
while((text[i]=getche())!=13)
i++;
printf("\n");
for(i=0;text[i]!=13;i++){
++freq[text[i]];
}
for(i=65; i<=91; i++ ){
if(freq[i]==0)
continue;
printf("%c: ", i);
for(int j=0; j<freq[i]; j++)
{printf(" * ");}
printf("\n");
}
}
```

Question#3: [32 points, CLO2, 25 mins]

Write a program for new red line bus service where we want to keep track of daily ticket sales, for each bus, in every city. The number of cities, buses and tickets are set to following values:

Number of cities = last digit of your ID + 2
Number of buses in each city = last two digits of your ID
Number of ticket sales for each bus = last three digits of your ID

Your program should ask your ID in one variable, for example "22k-1234", and extract above given values. For every ticket in every bus at every city, your program should also ask user's age and calculates appropriate ticket price i.e., for every ticket, there are three possible charges:

Full price
Elderly (age > 60) 30% discount on the ticket price
Children (age < 6) 50% discount on the ticket price

Let us assume the total ticket price is set to *varCharges* rupees (user specified), then your program should calculate and display sales track in following format:

All Data:

City	Bus	Passenger	age	amount rupees
City 1	Bus 1	Passenger 1	55	500 rupees
City 1	Bus 1	Passenger 2	50	500 rupees
City 1	Bus 1	Passenger 3	75	350 rupees
City 1	Bus 2	Passenger 1	5	250 rupees
City 1	Bus 2	Passenger 2	35	500 rupees
City 2	Bus 1	Passenger 1	15	500 rupees

Total sales for each bus in each city:

City	Bus	Total Sales
City 1	Bus 1	1,350 rupees
City 1	Bus 2	750 rupees
City 2	Bus 1	120,000 rupees
City 3	Bus 1	120,000 rupees
City 3	Bus 2	120,000 rupees

How much money has been discounted in total for all the buses and cities [Description: We have discounted 400,000 rupees for elders and 200,000 rupees for children for all cities]

[**hint:** A char variable on any index in string str1 can be converted to int using casting, ex: int a = int(str1[5]-'0');]

```c
#include<stdio.h>


/*
CHECKING RUBERICS:
There are four major parts:
- Extracting data from string, Creating and storing all data using 2D or 3D array.
- Printing all data in tabular form
- Calculation of total sales for buses and printing it
- Calculation of discounted amount for all cities

*/

void main()
{


    int countChildren = 0, countElders = 0;
    int varCharges = 0;
    printf("Enter Ticket Charges: ");
    scanf("%d", &varCharges);
      printf("Enter your ID: ");
    char myID[]="22k-1234";
    scanf("%s", myID);
    int cities = (int)(myID[7] - '0'), buses = ((int)(myID[6] - '0')*10) + (int)(myID[7] - '0'), tickets =
((int)(myID[5] - '0')*100) + ((int)(myID[6] - '0')*10) + (int)(myID[7] - '0');

    printf("\nCities: %d, Buses: %d, Tickets: %d\n", cities, buses, tickets);
    int rows = cities * buses * tickets, cols = 5; // Five columns to store city, bus, passenger, age, ticket
price
    int allData [rows][cols];
```

```c
    int citiCounter = 0, busCounter = 0, ticketCounter = 0;


    // Data Input in the array

    for(int i=0; i< rows; i++)
    {
        if(ticketCounter == tickets)
        {
                busCounter++;
                ticketCounter=0;
                        }
        if(busCounter == buses)
        {
                citiCounter++;
                                busCounter=0;
                                ticketCounter=0;
                        }
        allData[i][0] = citiCounter+1;
        allData[i][1] = busCounter+1;
        allData[i][2] = ticketCounter+1;

        int ageTemp =0, ticketTemp = 0;
        printf("Enter age for passenger in City %d, Bus %d, Ticket %d: ", citiCounter+1, busCounter+1,
ticketCounter+1);
        scanf("%d", &ageTemp);
        if (ageTemp < 6)
        {
            ticketTemp = 0.5 * varCharges;
            countChildren += (varCharges - ticketTemp);
        }
        else if (ageTemp > 60)
        {
            ticketTemp = 0.3 * varCharges;
            countElders += (varCharges - ticketTemp);
        }
        else
            ticketTemp = varCharges;

        allData[i][3] = ageTemp;
        allData[i][4] = ticketTemp;

        ticketCounter++;

    }
// Output in tabular form
printf("\n\nAll Data:\n");
printf("\n\nCity\tBus\tPassenger\tage\tamount rupees\n");
    for(int i=0; i< rows; i++)
        {
            printf("City %d, Bus %d, Passenger %d,\t %d,\t %d\n", allData[i][0], allData[i][1], allData[i][2],
allData[i][3], allData[i][4]);
        }

citiCounter = 0, busCounter = 0, ticketCounter = 0;
printf("\nTotal Sales for Each bus:\n\n");
```

```c
    int busSales = 0;
    for(int i=0; i< rows; i++)
      {
         if(ticketCounter == tickets)
            busCounter++;
         if(busCounter == buses)
            citiCounter++;

         if ((i+1) % buses != 0)
            busSales += allData[i][4];
         else
            {
               printf("City %d, Bus %d = %d rupees,\n", allData[i][0], allData[i][1], busSales);
               busSales = 0;
            }
         ticketCounter++;

      }



    // Using variables of countChildren and countElders, we can print all discounted amount

    printf("\nWe have discounted %d rupees for elders and %d rupees for children for all cities",
countChildren, countElders);

}
```

BEST OF LUCK!