Department of Computer Science & Engineering
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Practice Sheet #04

Topic: Arrays and Strings

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Instructions:

For the questions consisting code segments, assume necessary libraries have been included. In case, if you feel any discrepancy, kindly state relevant assumption with proper reason.

Every question has only one correct option among given four options. If you feel none of the option is correct then state your answer with proper reason.

1. Figure out the output of the below code written in C Programming Language. State relevant Assumptions, if any, during computation.

```c
#include<stdio.h>
int main()
{
  int arr[2] = {10, 20, 30, 40, 50};
  printf("%d", arr[1]);
  return 0;
}
```
   (a) 20
   (b) Error at Line 4
   (c) 10
   (d) 40

2. Figure out the output of the below code. State relevant assumption if any during computation.

```c
#include<stdio.h>
int main()
{
  int arr[2];
  printf("%d ", arr[3]);
  printf("%d ", arr[-2]);
  return 0;
}
```

   (a) Any Random Values
   (b) Error at printf("%d ",arr[3]);
   (c) Error at Line 5
   (d) Assignment Required after Declaration of Array

3. Figure out the output of the below code. State relevant assumption if any during computation.

```c
#include<stdio.h>
    int main()
    {
      int arr[5];
      arr[0] = 5;
      arr[2] = -10;
      arr[3/2] = 2;
      arr[3] = arr[0];
      printf("%d %d %d %d", arr[0], arr[1], arr[2], arr[3]);
      return 0;
    }
```

(a) 5 2 -10 5
(b) 2 -10 5 2
(c) Error at line 7
(d) 4- 5 -10 2 5

4. Which of the following integer arrays among arr1, arr2, arr3 are terminated by a null character during storage in memory. State relevant assumption if any during computation. Assume necessary libraries have been included.

```c
#include<stdio.h>
    int main()
    {
       char arr1[] = "Five";
       char arr2[5] = "Five";
       char arr3[]= {'F', 'i', 'v', 'e'};
       return 0;
    }
```

(a) arr1 only
(b) arr1 & arr2
(c) arr2 & arr3
(d) D- arr 3 only

5. Which of the following declaration of integer arrays among a1, a2, a3 in the below code will cause error during compile time. State relevant assumption if any during computation. Assume necessary libraries have been included.

```c
#include<stdio.h>
    int main()
    {
      int a1[][][2] = { {{1, 2}, {3, 4}},
                {{5, 6}, {7, 8}}
                  };
      int a2[][2] = {{1,2},{3,4}};
      int a3[][2][2] = { {{1, 2}, {3, 4}},
                  {{5, 6}, {7, 8}}
                  };
      return 0;
    }
```

(a) a2 only

(b) a1 only

(c) a2 & a3 both

(d) No compile time error

6. Figure out the output of the below code. State relevant assumption if any during computation.

Assume Necessary libraries have been included.

```c
#include <stdio.h>
  int main()
  {
    char *s = "Harry Potter";
    s[0] = 'K';
    printf("%s", s);
    return 0;
  }
```

(a) Segmentation Fault on GCC

(b) Karry

(c) Potter

(d) 4- Karry Potter

7. Figure out the output of the below code. State relevant assumption if any during computation.

Assume Necessary libraries have been included.

```c
#include<stdio.h>
int main()
{
    char *str = "A for Apple " "B for Ball " "C for Cat";
    puts(str);
    return 0;
}
```

(a) Compilation Error at Line 4

(b) A for Apple   B for Ball   C for Cat

(c) A for Apple " "B for Ball " "C for Cat

(d) A for Apple

8. Figure out the output of the below code. State relevant assumption if any during computation.

Assume necessary libraries have been included.

```c
1.   int main()
2.   {
3.     void arr1[100];
4.     void *arr2[100];
5.   }
```

(a) No output but compiled and executed successfully

(b) Error at Line 4 : error : declaration of arr2 as array of void pointers

(c) 3-Error at Line 3: error : declaration of arr1 as array of void

(d) None of the above

9. Let A be a square matrix of size n x n. Consider the following program. What is the expected output?

```
C = 100
 for i = 1 to n do
    for j = 1 to n do
    {
        Temp = A[i][j] + C
        A[i][j] = A[j][i]
        A[j][i] = Temp - C
    }
 for i = 1 to n do
    for j = 1 to n do
        Output(A[i][j]);
```

    (a) The Matrix A Itself
    (b) Transpose of matrix A
    (c) Adding 100 to the upper diagonal elements and subtracting 100 from diagonal elements of A
    (d) None of the Above

10. What is the output printed by the following program?

```
#include<stdio.h>
void main()
{
    int A[]={0,1,2,3,4,5,6,7};
    int n=8, step = 2, i, j, k, l, temp;

    for(i=0;i<n-step;i++){
       for(j=i;j<i+step;j++){
           temp = A[j];
           A[j] = A[j+1];
           A[j+1] = temp;
       }
        step = (step*2)- 1;
    }
    for(i=0; i<n; i++)
       printf("%d ",A[i]);
}
```

11. What is the output of the following program?

```
main()
{
    int a[5] = { 5, 1, 15, 20, 25 };
    int i, j, k;

    i = ++a[1];
    j = a[1]++ ;
```

```
        k = a[i++] ;

        printf ("%d,%d,%d", i, j, k);
}
```

Problems for Programming Practice
(After the successful studies of Lecture 04 (Arrays and Strings), the students are supposed to solve the following problems in C programming language.)

1. Write a program to read an integer 1D array containing 8 bits (0s, 1s) of an unsigned binary integer. The program should print the decimal value for the integer.

2. Read a 1D array containing n elements (n input by user) containing only 0s and 1s. Print the length of the longest run of 1s. For example, in the array 01011110011, the length is 4.

3. A fast scheme for evaluating a polynomial such as: $-19 + 7x - 4x^2 + 6x^3$, for a given value of $x = 3$ (for example) is to arrange the computation as follows: $((((0)x + 6)x + (-4))x + 7)x + (-19)$ and compute the result from the innermost brackets outwards.

   Write a program which reads the order of the polynomial N, the coefficients of the polynomial in ascending order of powers and then stores them in a float array. There are no missing terms in the polynomial. The program then reads a value of x, and computes the value of the polynomial for that x.
   [Hint: Use the fast method described above.]

4. Consider an integer array where each element has a value either 0 or 1. Write a program to rearrange the array such that all the 0s appear before the 1s.Write a program to read three integers and print the largest among them.

5. Read n integers and print the third largest among them. n is input by user. You may use an array to store all the input numbers.

6. Currency notes are available in the following seven denominations: Rs. 1, Rs. 2, Rs. 5, Rs. 10, Rs. 20, Rs. 50, and Rs. 100. You will first read an integer array (named purse[7]) of seven elements, where the array elements represents the number of notes of each denomination (in increasing order of denomination) available with you. You are also given an amount of money to be paid using these notes. The amount will be less than Rs. 1000. You have to pay the amount using minimum number of notes.
   Print the number of notes of each denomination which you will use to pay the amount. If the amount cannot be paid using the available notes, print "Failed to Pay".

7. An anagram is a word or phrase formed by rearranging the letters of another word or phrase. For example, "carthorse" is an anagram of "orchestra". Write a program which

reads two character strings of same length and prints whether they are anagrams of each other.

8. Write C functions to perform the following operations with two-dimensional arrays.
    i)   Reading any two dimensional array elements.
    ii)   Finding maximum and standard deviation of array elements.
    iii)   Printing the transpose of a matrix

    Test these functions by calling them from the main program with 2d-arrays having maximum dimension 3 x 4.

9. Consider a three dimensional vector space over integer. Write C programs to perform the following vector operations.

    i.   Dot product of two vectors.
    ii.   Cross product of two vectors.

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