

National Institute of Technology,
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Assignment - 2

Subject : Data Structures Laboratory.

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DS Lab Assignment - 2

Implement the following programs using pointers and user defined functions only

Q.1. Accept an integer NUM from the user and display its address using pointer methodologies.

Source Code:

```
#include <stdio.h>

void display (int *ptr) {
    printf ("Value of NUM : %d :: Address of NUM : %p",
        *ptr, ptr);
}

int main () {
    int NUM, *ptrNUM = &NUM;
    printf ("Enter an integer NUM : ");
    scanf ("%d", &NUM);
    display (ptrNUM);

    return 0;
}
```

Output :-

Enter an integer NUM : 4
Value of NUM : 4 :: Address of NUM : 0x7ffffd422d97c

Q.2. Implement a pointer to an array to display all the array elements alongside the addresses.

Source Code :

```
#include <stdio.h>
#include <stdlib.h>

void display (int *ptr, int size) {
    for (int i=0 ; i<size ; i++){
        printf ("value of a[%d] = %d :: Address of a[%d] = %p\n",
            i, *(ptr+i), i, (ptr+i));
    }
}

int main () {
    int *ptr_arr, *arr, n;
    printf ("Enter the size of array : ");
    scanf ("%d", &n);
    arr = (int *)malloc (sizeof (int) * n);

    for (int i = 0 ; i < n ; i++) {
        printf ("a[%d] : ", i);
        scanf ("%d", &arr[i]);
    }

    ptr_arr = &arr[0];
    display (ptr_arr, n);

    return 0 ;
}
```

Output :-

Enter the size of array : 4

$a[0] = 1$

$a[1] = 2$

$a[2] = 3$

$a[3] = 4$

Value of $a[0] = 1$:: Address of $a[0] = 0x55874a361ac0$

Value of $a[1] = 2$:: Address of $a[1] = 0x55874a361ac4$

Value of $a[2] = 3$:: Address of $a[2] = 0x55874a361ac8$

Value of $a[3] = 4$:: Address of $a[3] = 0x55874a361acc$

Q.3. Accept an array of integers ARR[] from the user to implement a call by reference and find the sum of the odd numbers and even numbers separately.

Source Code :-

```
#include <stdio.h>
#include <stdlib.h>

void sum (int *ptr, int size) {
    int even = 0, odd = 0;
    for (int i = 0 ; i < size ; i++) {
        if (*(ptr+i) % 2 == 0)
            even += *(ptr+i);
        else
            odd += *(ptr+i);
    }
    printf("Sum of Odd Values : %d\n", odd);
    printf("Sum of Even Values : %d", even);
}

int main() {
    int *ARR;
    int n;
    printf("Enter the size of array : ");
    scanf ("%d", &n);
    ARR = (int *) malloc (sizeof(int)*n);
    for (int i = 0 ; i < n ; i++) {

        printf("ARR[%d] : ", i);
        scanf ("%d", &ARR[i]);
    }
    sum (ARR, n);
    return 0;
}
```

Output :-

Enter the size of array : 5

ARR[0] : 3

ARR[1] : -4

ARR[2] : 0

ARR[3] : 2

ARR[4] : -7

Sum of Odd Values : -4

Sum of Even Values : -2

Q.4. Design a 2D Matrix of size 4×4 and display the elements using pointer to array.

Source Code :

```
#include <stdio.h>
void display (int a[4][4]) {
    printf ("The elements of the 4x4 matrix are : \n");
    int x = 1;
    for (int *p = &a[0][0]; p <= &a[3][3]; p++) {
        printf ("%d ", *p);
        if (x % 4 == 0)
            printf ("\n");
        x++;
    }
}

int main () {
    int arr[4][4];
    for (int i = 0; i < 4; i++) {
        printf ("Enter your elements for row %d : ", i+1);
        for (int j = 0; j < 4; j++) {
            scanf ("%d", &arr[i][j]);
        }
    }
    display (arr);
    return 0;
}
```


Output :-

Enter your elements for row 1: 1 2 3 4

Enter your elements for row 2 : 5 6 7 8

Enter your elements for row 3: 9 10 11 12

Enter your elements for row 4: 13 14 15 16

The elements of the 4×4 matrix are :

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16