

Batch: P5-2 Roll No.: 16010422185

Experiment / assignment / tutorial No. 7

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of the Staff In-charge with date

TITLE: Using virtual labs to understand the concept of matrix multiplication, call by reference

AIM: Use of virtual labs to understand the concepts and theory with examples and verify the same with practice questions.

Expected OUTCOME of Experiment:

Books/ Journals/ Websites referred:

1. Programming in ANSI C, E. Balagurusamy, 7 th Edition, 2016, McGraw-Hill Education, India.
2. Structured Programming Approach, Pradeep Dey and Manas Ghosh, 1 st Edition, 2016, Oxford University Press, India.
3. Let Us C, Yashwant Kanetkar, 15th Edition, 2016, BPB Publications, India.

Problem Definition:

Virtual Lab experiment on matrix multiplication

<https://cse02-iiith.vlabs.ac.in/exp/arrays/simulation.html>

Virtual Lab experiment on Call by reference

<https://cse02-iiith.vlabs.ac.in/exp/pointers/procedure.html>

1.Matrix Multiplication.

Implementation details/ Simulation screenshots:

The screenshot shows a C++ IDE with three panels: Initialize, Step Execution, and Code Output.

Initialize Panel: Matrix size is set to 2 x 3. Buttons include 'OK', 'Generate Values For B', 'Start', and 'Next'.

Step Execution Panel: Displays the following C++ code:

```
int main(){
    int i,j,k;
    int matA[i][j];
    int matB[j][k];
    int matMul[i][k];
    int p,q,r;
    for ( p = 0 ; p < i ; p++ )
    {
        for ( r = 0 ; r < k ; r++ )
        {
            matMul[p][r] = 0;
            for ( q = 0 ; q < j ; q++ )
            {
                matMul[p][r] += matA[p][q]*matB[q][r]
            }
        }
    }
}
```

Code Output Panel: Shows the output of the matrix multiplication.

Matrix A		Matrix B	
4	12	10	7
0	7	0	11
11	12	0	11

Resultant Matrix:

40	160	180
0	77	84
110	209	243

The memory address of the first element of an array is called

☐ a: Floor address

☐ b: Foundation address

☐ c: First address

☒ d: Base address

The memory allocation for array elements is done

☒ a: Contigously

☐ b: Randomly

If the memory address of the first element of an array is 2000, what is the memory address of the 6th emement

☒ a: 2020

☐ b: 2012

☐ c: 2006

☐ d: 2024

In C programming, a string is actually a

☐ a: Array of integers

☒ b: Array of characters

☐ c: Variable

☐ d: None of the above

2.Program to swap two numbers without using a third variable using Call by reference

Implementation details/ Simulation screenshots:

Program Code		Memory Map					
		Address	BYTE 1	BYTE 2	BYTE 3	BYTE 4	Variable
<pre>#include<stdio.h> void main(){ int A = 5, B = 9; printf("Value of A is %d\n",A); printf("Value of B is %d\n",B); swap(&A, &B); printf("Value of A after swapping is %d\n",A); printf("Value of B after swapping is %d\n",B); } void swap(int *Pa , int *Pb){ int temp = *Pa; *Pa = *Pb; *Pb = temp; }</pre>		60	0	0	0	9	A
		56	0	0	0	5	B
		52					
		48					
		44					
		40					
		36					
		32					
		28					
		24					
		20					
		16					
		12					
		8					
		4					
		0					
		Program Memory					
		Program Memory					
		Reserved By Os					

```
#include<stdio.h>
void swap(int *, int *);
main()
{
    int a, b;
    printf("a = ");
    scanf("%d", &a);
    printf("b = ");
    scanf("%d", &b);
    printf("Before swapping a = %d and b = %d\n", a, b);
    swap(&a, &b);
    printf("After swapping a = %d and b = %d\n", a, b);

    return 0;
}
void swap(int *a, int *b)
{
    *a = *a + *b;
    *b = *a - *b;
    *a = *a - *b;
}
```

Output(s)/Post-test Screenshots:

```
a = 787
b = 877
Before swapping a = 787 and b = 877
After swapping a = 877 and b = 787
```

1. Pointer is a :

☒ a: A keyword used to create variables

☐ b: A variable that stores address of an instruction

☐ c: A variable that stores address of other variable

☐ d: All of the above

2. If a variable is a pointer to a structure, then which of the following operator is used to access data members of the structure through the pointer variable?:

☐ a: .

☐ b: &

☐ c: *

☒ d: ->

3. The name of the array is a pointer to the _____ element of the array.

☒ a: first

☐ b: second

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3 out of 3

Conclusion and your take away after performing the virtual lab experiment: -

Two numbers are swapped using call by reference without using a third variable with implementation of proper logic.

Post Lab Descriptive Questions

- 1. Differentiate between Call by Value and Call by Reference.**
 - 2. Try to understand the working of pointers by Running the following code and noting down the output.**
- ```
main()
```

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```
{
int i = 3 ;
int *j ;
j = &i ;
printf ("\nAddress of i = %u", &i) ;
printf ("\nAddress of i = %u", j) ;
printf ("\nAddress of j = %u", &j) ;
printf ("\nValue of j = %u", j) ;
printf ("\nValue of i = %d", i) ;
printf ("\nValue of i = %d", *(&i)) ;
printf ("\nValue of i = %d", *j) ;
}
```

Ans 1:

| Sr. no. | Call by Value                                                       | Call by Reference                                              |
|---------|---------------------------------------------------------------------|----------------------------------------------------------------|
| 1.      | Value of the variable is passed.                                    | Address Of the variable is passed.                             |
| 2.      | Can't change the value of actual argument by using formal argument. | Can change the value of actual argument using formal argument. |
| 3.      | No pointers are used.                                               | Pointers are used.                                             |
| 4.      | Requires more memory.                                               | Requires less memory.                                          |
| 5.      | It is less efficient.                                               | It is more efficient.                                          |

Ans 2:

```
Address of i = 6422300
Address of i = 6422300
Address of j = 6422296
Value of j = 6422300
Value of i = 3
Value of i = 3
Value of i = 3
```

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**Date:** \_\_\_\_\_

**Signature of faculty in-charge**

**Department of Science and Humanities**

