ASSIGNMENT 7: MULTIDIMENSIONAL ARRAY

Note: Whenever possible write programs using arrays on stack as well as arrays on heap.

1. **Define an array of character pointers. Write a function to allocate memory for names. Write a function to accept five names from the user. Write another function to print these names. Write a function to sort names. Finally write a function to free memory allocated for student names.**

2. **Define an array of double pointers. Write a function to allocate memory for matrix having double values. Write a function to accept matrix from the user. Write another function to print the matrix.**

3. **Extend question 2 to accept two matrices. And Write functions calculate**
   a. **Sum of 2 matrices**
   b. **Subtraction of 2 matrices**
   c. **Multiplication of 2 matrices**

4. **Extend question 2. Write a function to calculate the sum of elements in the given row. Write another function to calculate the sum of elements in the given column. Write a function to calculate sum of both diagonal elements.**

5. **Extend question 4 to check whether given matrix is magic square or not.**

6. **Implement all above codes using 2D array on stack.**

7. **Define** `char maze[12][12];`

   initialize maze with following values

```
x x x x x x x x x x x x
x - - - x - - - - - - x
- - x - x - x x x x - x
x x x - x - - - - x - x
x - - - - x x x - x - -
x x x x - x - x - x - x
x - - x - x - x - x - x
x x - x - x - x - x - x
x - - - - - - - - x - x
x x x x x x - x x x - x
x - - - - - - x - - - x
x x x x x x x x x x x x
```

   The symbol x represent wall of the maze and – symbol represents squares in the possible path through the maze. A simple trick to come out of maze is put your hand on the wall either right side or left side and move along the wall. If no other outlet you will come to the entrance where you started. Write function to find out the path. Try with other combinations.

Display the output as follow.

```
x x x x x x x x x x x x
x = = = x = = = = = = x
= = x = x = x x x x = x
x x x = x = = = = x = x
x - - = = x x x = x = =
x x x x = x - x = x - x
x - - x = x - x = x - x
x x - x = x - x = x - x
x - - - = = = = = x - x
x x x x x x - x x x - x
x - - - - - - x - - - x
x x x x x x x x x x x x
```

8. **Write a program to accept list of names as command line arguments and display the names.**

9. **Write a program to accept a set of numbers as command line arguments and calculate sum and average of all nos.**

10. **Write a program to accept a operands and operator as command line argument and perform the operation using four function calculator.**

11. **Write functions to allocate memory for multidimensional matrix. Write another function to free the memory allocated for multidimensional dimensional matrix. Is it possible to send no of dimensions as a function argument?**

12. **Write a function to Calculate day of week for given date. (for day of week use array of character pointers)**

13. **Write a function to accept five student information (roll no, name, marks for 3 subjects). Write another function to print student information. Write a function to process students mark sheet (calculate grades and total marks). Finally write a function to sort student information on total marks descending.**

14. **Write a function to convert a number to its roman equivalent. Write another function to convert a roman number to decimal equivalent.**

15. **Write a function to display given amount in words.**

16. **Write a function to display generate hamming code from given 7 bit data. Write another function to return data from hamming code;**

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- **Populate array programmatically as per following values**

(a) Spiral

1	2	3	4	5
16	17	18	19	6
15	24	25	20	7
14	23	22	21	8
13	12	11	10	9

(b) Zigzag Scan

1	2	6	7	15
3	5	8	14	16
4	9	13	17	22
10	12	18	21	23
11	19	20	24	25

(C) Magic Square

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

- **Write above codes using only one loop (no nested loops). Hint: How to implement state machines?**

- **Search on net eight queen's problem and knight's tour.**