**Department of Computer Engineering**
**Academic Term II: 23-24**

**Class: B.E (Computer), Sem – VI    Subject Name: Artificial Intelligence**

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| Practical No: | 2 |
|---|---|
| Title: | Tic Tac Toe game implementation by Magic Square Method |
| Date of Performance: | |
| Date of Submission: | |

## Rubrics for Evaluation:

| Sr. No | Performance Indicator | Excellent | Good | Below Average | Marks |
|---|---|---|---|---|---|
| 1 | On time Completion & Submission (01) | 01 (On Time) | NA | 00 (Not on Time) | |
| 2 | Logic/Algorithm Complexity analysis (03) | 03(Correct ) | 02(Partial) | 01 (Tried) | |
| 3 | Coding Standards (03): Comments/indention/Naming conventions Test Cases /Output | 03(All used) | 02 (Partial) | 01 (rarely followed) | |
| 4 | Post Lab Assignment (03) | 03(done well) | 2 (Partially Correct) | 1(submitted) | |
| **Total** | | | | | |

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# Experiment No: 2

**Title**: Tic Tac Toe game implementation by Magic Square Method

**Objective:** To write a computer program in such a way that computer wins most of the time using Magic Square Method

## Theory:

A player who places his coins first across the same row or same column or same diagonal wins the game. Let us take a magic square of order 3 x 3 (for 3 coins game). The sum of the numbers across rows, columns and diagonals are the same - it is 15. That is, a player who places his coins such that he gets the perfect score of 15 takes the prize.
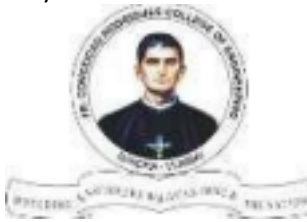
1) Board is considered to be a magic square of size 3 X 3 with 9 blocks numbered by numbers indicated by the magic square.
2) This representation makes the process of checking for a possible win simpler.
   Board Layout as magic square. Each row, column and diagonals add to 15.

| | | | |
|---|---|---|---|
| 8 | 3 | 4 | **15** |
| 1 | 5 | 9 | **15** |
| 6 | 7 | 2 | **15** |

3) Maintain the list of each player's blocks in which he has played.
   Consider each pair of blocks that the player owns.
   Compute difference D between 15 and the sum of the two blocks.

If D < 0 or D > 9 then

i) These two blocks are not collinear and so can be ignored.

ii) Otherwise, if the block representing difference is blank (i.e., not in either list) then a move in that block will produce a win.

**OUTPUT:**



**Post Lab Assignment:**

1. What is the relationship between tic-tac-toe and magic square?
2. What is a magic square of order n?

Post Lab Assignment : Experiment - 2.

Q.1. What is the relationship between tic-tac-toe and magic square ?

Ans. 1. Tic-Tac-Toe and magic square are related through the arrangement of the game board.

2. In Tic-Tac-Toe players aim to create winning combinations of their marks in rows, columns or diagonals.

3. A magic square is a grid where the sum of numbers in each row, column and diagonal is the same.

4. The numbers in a magic square can represent positions on the Tic-Tac-Toe grid.

5. By using the numbers of a magic square, we can easily identify winning combinations in Tic-Tac-Toe.

Q.2. What is a magic square of order n ?

Ans. 1. A magic square is a square grid containing numbers arranged in a way that each row, column and diagonal adds up to the same constant sum.

2. The order of a magic square refers to the number of rows and columns it has.

3. For a magic square of order n, it contains n rows and n columns.

4. The numbers used in a magic square of order n range from 1 to $n^2$.

5. The sum of each row, column, and diagonal in a magic square of order n is called the magic constant, denoted by M.

Formula for calculating the magic constant (M) of a magic square of order n.

$$M = \frac{n \cdot (n^2 + 1)}{2}$$

where

M → Magic Constant.

n → order of magic square