Round 2 (R2)-Storyboard

Name of Faculty: Mr.Praveen Goyal

Institute: Rajkiya Engineering College ,Banda

Email ID (as submitted in the registration form) **:** praveen_soit@yahoo.com

Discipline to which the Lab belongs: Information Technology

Name of the Lab: Data Structure

Name of experiment: Tower of Hanoi

Kindly Refer these documents before filling the worksheet

1. Coursework (MOOC) on Pedagogy , Storyboard , Lab Manual : h ttp://bit.ly/Vlabs-MOOC 2. Additional Documentation booklet for reference. http://vlabs.iitb.ac.in/vlabs-dev/document.php

3.Sample Git Repository. : https://github.com/BootTeam11/Boot2k19.git

Round 2

1. Story Outline:

To understand and code the problem of Tower of Hanoi using recursion for n disks.

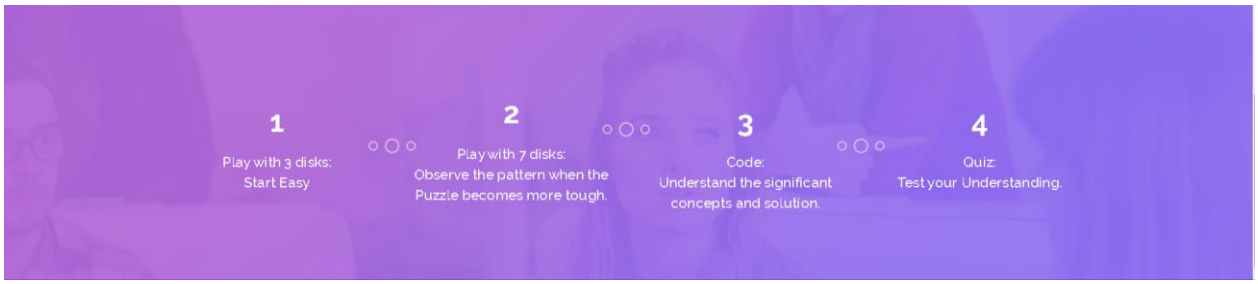
2. Story:

The Tower of Hanoi is a mathematical game or puzzle. It consists of three rods, and a number of disks of different sizes which can slide onto any rod. The puzzle starts with the disks in a neat stack in ascending order of size on one rod, the smallest at the top, thus making a conical shape. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:

- Only one disk can be moved at a time.
- Each move consists of taking the upper disk from one of the stacks and placing it on top of nother stack i.e. a disk can only be moved if it is the uppermost disk on a stack.
- No disk may be placed on top of a smaller disk. With three disks, the puzzle can be solved in seven moves.

The minimum number of moves required to solve a Tower of Hanoi puzzle is 2 n - 1, where n is the number of disks.

2.1 Set the Visual Stage Description:



2.2 Set User Objectives & Goals:

- **A Glimpse at the Puzzle**
  The student is made aware of the importance of the puzzle through mentioned history.

- **Game Play of 3 disks**
  The student is supposed to solve the puzzle consisting of three disks following the instructions.

- **Game Play of 7 disks**
  The student is supposed to solve the puzzle consisting of seven disks following the instructions.

- **Coding the Solution**
  The student is supposed to understand the approach to solution of the puzzle ad comprehend the code.

- **Quiz**
  The student is supposed to answer the questions after playing the games and comprehending the code.

2.3 Set the Pathway Activities:

- **Game Play of 3 disks**
  The student is supposed to solve the puzzle consisting of three disks following the instructions.

- **Game Play of 7 disks**
  The student is supposed to solve the puzzle consisting of seven disks following the instructions.

- **Coding the Solution**
  The student is supposed to understand the approach to solution of the puzzle ad comprehend the code.

2.4 Set Challenges and Questions/Complexity/Variations i n Questions:

Quiz/Comprehension check: A sequence of questions followed based on gameplay and solution to the code.(Concept of Recursion)

2.5 Allow pitfalls:

- Student is allowed to skip to the solution page in case she/he fails to solve the Puzzle.

2.6 Conclusion:

Understand the concept of recursion and use it for solving the puzzle as its application.

2.7 Equations/formulas:

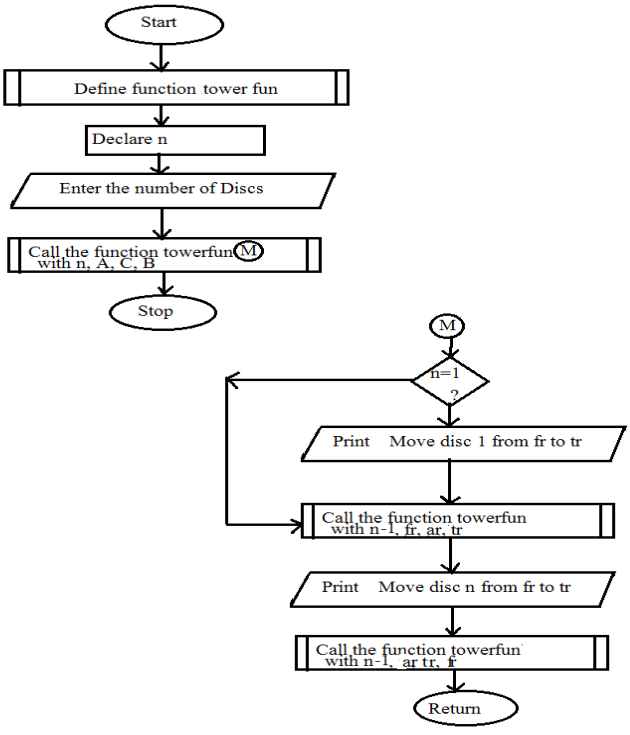
- The minimum number of moves required to solve a Tower of Hanoi puzzle is 2^n - 1, where n is the number of disks.

- ```
  using namespace std;

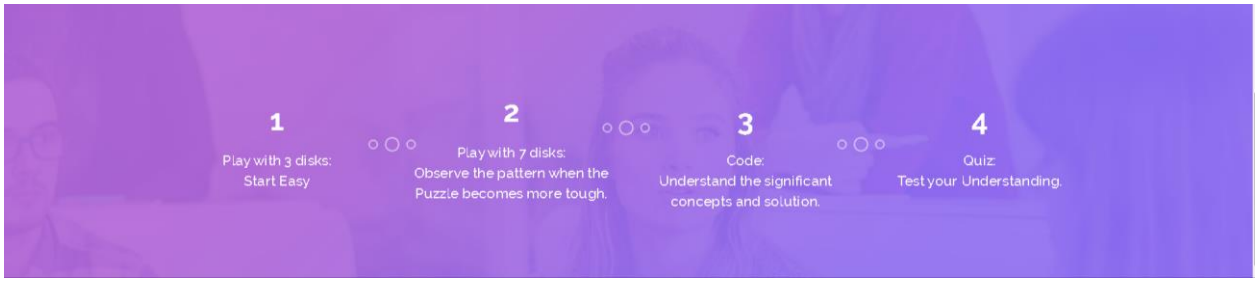
  void towerOfHanoi(int n, char from_rod,
                    char to_rod, char aux_rod)
  {
      if (n == 1)
      {
          cout << "Move disk 1 from rod " << from_rod <<
                              " to rod " << to_rod<<endl;
          return;
      }
      towerOfHanoi(n - 1, from_rod, aux_rod, to_rod);
      cout << "Move disk " << n << " from rod " << from_rod <<
                                    " to rod " << to_rod << endl;
      towerOfHanoi(n - 1, aux_rod, to_rod, from_rod);
  }

  // Driver code
  int main()
  {
      int n = 4; // Number of disks
      towerOfHanoi(n, 'A', 'C', 'B'); // A, B and C are names of rods
      return 0;
  }
  ```

.Flowchart


  ```

Mindmap



3. Storyboard