BHARATIYA VIDYA BHAVAN'S
SARDAR PATEL INSTITUTE OF TECHNOLOGY
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai – 400058-India

DEPARTMENT OF COMPUTER ENGINEERING
SUBJECT: Artificial Intelligence and Machine Learning

Name	Manish Shashikant Jadhav
UID no.	2023301005

Experiment 1	
AIM :	Implement an Intelligent agent (problem formulation and implementation) Missionaries and Cannibal Problem: - In the missionaries and cannibals' problem, three missionaries and three cannibals must cross a river using a boat which can carry at most two people, under the constraint that, for both banks, if there are missionaries present on the bank, they cannot be outnumbered by cannibals (if they were, the cannibals would eat the missionaries). The boat cannot cross the river by itself with no people on board.
Code:	boat_side = "Right" missionary_on_right = 3 cannibals_on_right = 3 missionary_on_left = 0 cannibals_on_left = 0 def print_state(): print(f"Missionaries on left = {missionary_on_left} Cannibals on left = {cannibals_on_left}", *end*='') print(" |-----Boat| " *if* boat_side == "Right" *else* " |Boat-----| ", *end*='') print(f"Missionaries = {missionary_on_right} Cannibals on right = {cannibals_on_right}") print_state() *while* True: missionary = int(input(f"Enter number of Missionary in boat on {boat_side}: ")) cannibals = int(input(f"Enter number of Cannibals in boat on {boat_side}: ")) *# Condition for peoples on boat should be 1 or 2 only.* *if* (missionary + cannibals) not in [1, 2]: print("Invalid move: Total people in boat must be 1 or 2") *continue*

```
    if boat_side == "Right":
        if missionary > missionary_on_right or cannibals > cannibals_on_right:
            print("Invalid move: Not enough people on the right side")
            continue

        missionary_on_right -= missionary
        cannibals_on_right -= cannibals
        missionary_on_left += missionary
        cannibals_on_left += cannibals
        boat_side = "Left"
    else:
        if missionary > missionary_on_left or cannibals > cannibals_on_left:
            print("Invalid move: Not enough people on the left side")
            continue

        missionary_on_right += missionary
        cannibals_on_right += cannibals
        missionary_on_left -= missionary
        cannibals_on_left -= cannibals
        boat_side = "Right"

    print_state()

    # These condition checks whether condition for win is not satisfied i.e. you loose
    if (missionary_on_right != 0 and missionary_on_right < cannibals_on_right) or \
       (missionary_on_left != 0 and missionary_on_left < cannibals_on_left):
        print("YOU LOSE")
        break

    # These condition checks whether condition for win is satisfied i.e. you win
    if missionary_on_left == 3 and cannibals_on_left == 3:
        print("YOU WIN")
        break

print("GAME OVER")
```

OUTPUT:

```
PS D:\Manish\SPIT> & C:/Users/manis/AppData/Local/Programs/Python/Python311/python.exe "d:/Manish/SPIT/5th SEM/AIML/Lab/Exp1/exp1.py"
Missionaries on left = 0 Cannibals on left = 0 |-----Boat| Missionaries = 3 Cannibals on right = 3
= 0
Enter number of Missionary in boat on Left: 0
Enter number of Cannibals in boat on Left: 1
Missionaries on left = 0 Cannibals on left = 2 |-----Boat| Missionaries = 3 Cannibals on right = 1
Enter number of Missionary in boat on Right: 2
Enter number of Cannibals in boat on Right: 0
Missionaries on left = 2 Cannibals on left = 2 |Boat-----| Missionaries = 1 Cannibals on right = 1
Enter number of Missionary in boat on Left: 1
Enter number of Cannibals in boat on Left: 1
Missionaries on left = 1 Cannibals on left = 1 |-----Boat| Missionaries = 2 Cannibals on right = 2
Enter number of Missionary in boat on Right: 2
Enter number of Cannibals in boat on Right: 0
Missionaries on left = 3 Cannibals on left = 1 |Boat-----| Missionaries = 0 Cannibals on right = 2
Enter number of Missionary in boat on Left: 0
Enter number of Cannibals in boat on Left: 1
Missionaries on left = 3 Cannibals on left = 0 |-----Boat| Missionaries = 0 Cannibals on right = 3
Enter number of Missionary in boat on Right: 0
Enter number of Cannibals in boat on Right: 2
Missionaries on left = 3 Cannibals on left = 2 |Boat-----| Missionaries = 0 Cannibals on right = 1
Enter number of Missionary in boat on Left: 0
Enter number of Cannibals in boat on Left: 1
Missionaries on left = 3 Cannibals on left = 1 |-----Boat| Missionaries = 0 Cannibals on right = 2
Enter number of Missionary in boat on Right: 0
Enter number of Cannibals in boat on Right: 2
Missionaries on left = 3 Cannibals on left = 3 |Boat-----| Missionaries = 0 Cannibals on right = 0
YOU WIN
GAME OVER
PS D:\Manish\SPIT>
```

PEAS for problem:

1. **Performance Measure:**
   - Successfully moving all missionaries and cannibals to the left side of the river
   - Avoiding any state where cannibals outnumber missionaries on either side
   - Minimizing the number of moves required to complete the task.
2. **Environment:**
   - The river with two banks (left and right)
   - Three missionaries and three cannibals
   - A boat that can carry one or two people
   - States of the environment change based on the movements of missionaries and cannibals.
3. **Actuators:**
   - The ability to move the boat from one side to the other
   - The ability to load and unload missionaries and cannibals onto/from the boat.
4. **Sensors:**
   - The ability to count the number of missionaries and cannibals on each side of the river
   - The ability to determine the current location of the boat
   - The ability to check if the current state is valid (i.e., missionaries are not outnumbered by cannibals)

CONCLUSION:

Hence by completing this experiment I came to know about Implement an Intelligent agent (problem formulation and implementation) Missionaries and Cannibal Problem.