Atharv R. Aundhkar **roll no : 4**

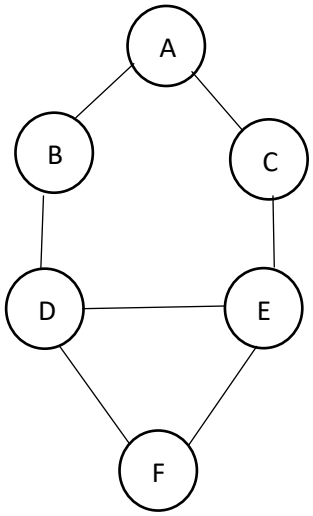
Practical no 1

Aim = Implement depth first search algorithm and Breadth First Search algorithm, Use an undirected graph and develop a recursive algorithm for searching all the vertices of a graph or tree data structure.

Code = DFS

```
def dfs(graph, start_node, goal_node):
    visited = set()
    stack = [(start_node, [start_node])]
    while stack:
        (current_node, path) = stack.pop()
        if current_node == goal_node:
            return path
        visited.add(current_node)
        for neighbor in graph[current_node]:
            if neighbor not in visited:
                stack.append((neighbor, path + [neighbor]))
    return None
graph = {
    'A': ['B', 'C'],
    'B': ['A', 'D'],
    'C': ['A', 'E'],
    'D': ['B', 'E', 'F'],
    'E': ['C', 'D', 'F'],
    'F': ['D', 'E']
}
start_node = 'B'
goal_node = 'D'
path = dfs(graph, start_node, goal_node)
if path is not None:
    print(f"Path from {start_node} to {goal_node}: {path}")
else:
   print(f"No path found from {start_node} to {goal_node}")
```

Graph =



Output =

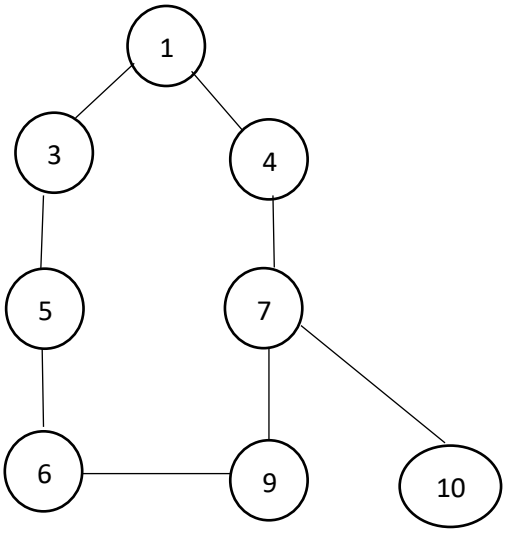
```
Path from B to D: ['B', 'D']
>
```

BFS

Code =

```
import collections
def bfs(graph, root,goal):
    visited, queue = set(), collections.deque([root])
    visited.add(root)
    while queue:
        vertex = queue.popleft()
        for current_node in graph[vertex]:
            if current_node not in visited:
                visited.add(current_node)
                queue.append(current_node)
        if goal==current_node:
            print(visited)
graph = {1: [3, 4], 3: [5], 5: [6], 4: [7], 7: [9, 10], 6: [9], 9: [6], 10: [7]}
print("Following is Breadth First Traversal: ")
bfs(graph,1,5)
```

Graph =



Output =

```
Following is Breadth First Traversal:
{1, 3, 4, 5}
```

Shravani D. Kadam Roll no = 23

Practical no 3

Aim : Implement Greedy search algorithm for Selection Sort

Code :

```
def Selection_Sort(array):
   for i in range(0, len(array) - 1):
      smallest = i
      for j in range(i + 1, len(array)):
         if array[j] < array[smallest]:
            smallest = j
      array[i], array[smallest] = array[smallest], array[i]


array = input('Enter the list of numbers: ').split()
array = [int(x) for x in array]
Selection_Sort(array)
print('List after sorting is : ', end='')
print(array)
```

output :

```
Enter the list of numbers: 8 9 55 1 4 4
List after sorting is : [1, 4, 4, 8, 9, 55]
>
```

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Practical no 2

Aim = Implement A star Algorithm for any game search problem.

Code =

```
import heapq
# Define the goal state
goal_state = [[1, 2, 3],
              [4, 5, 6],
              [7, 8, 0]]
# Define the heuristic function h(state)
def h(state):
    return sum(abs(state[i][j]//3 - i) + abs(state[i][j]%3 - j) for i in range(3) for j in range(3) if state[i][j])
# Define the A* search function
def a_star(start_state):
    heap = [(h(start_state), start_state, 0)]
    visited = set()
    while heap:
        (cost, state, g) = heapq.heappop(heap)
        if state == goal_state:
            return g
        if str(state) in visited:
            continue
        visited.add(str(state))
        for (i, j) in [(0, 1), (1, 0), (0, -1), (-1, 0)]:
            new_state = [row[:] for row in state]
            row, col = find_zero(new_state)
            new_row, new_col = row+i, col+j
            if 0 <= new_row < 3 and 0 <= new_col < 3:
                new_state[row][col], new_state[new_row][new_col] = new_state[new_row][new_col], new_state[row][col]
                heapq.heappush(heap, (g+h(new_state), new_state, g+1))
    return -1
# Define a function to find the location of the empty cell (0)
def find_zero(state):
    for i in range(3):
        for j in range(3):
            if state[i][j] == 0:
                return i, j
```

```
# Define a function to print the state
def print_state(state):
    for i in range(3):
        for j in range(3):
            print(state[i][j], end=' ')
        print()
# Define the start state
start_state = [[0, 2, 3],
               [1, 4, 6],
               [7, 5, 8]]
# Print the start state
print("Start state:")
print_state(start_state)
# Print the goal state
print("Goal state:")
print_state(goal_state)
# Compute the minimum number of moves required to reach the goal state from the initial state
cost = a_star(start_state)
print("Minimum number of moves:",cost)
```

output =

```
Start state:
0 2 3
1 4 6
7 5 8
Goal state:
1 2 3
4 5 6
7 8 0
Minimum number of moves: 4
```

Atharv R. Aundhkar **Roll no : 4**

Practical no

Aim = Develop an elementary chatbot for any suitable customer interaction application.

Code = import random

```
# Define some responses
responses = {
    "hi": ["Hello! , how can i help you..??"],
    "how are you": ["I'm doing well, thanks for asking.", "I'm fine, how about you?", "Not bad, and you?"],
    "goodbye": [ "Thankyou,hope we could help you out"],
    "default": ["Sorry, I don't understand.", "Could you please rephrase that?", "I'm not sure what you mean."],
    "what is this product?":["This is iphone 11."],
    "variant":["Ram : 64GB & processor : A13 Bionic "],
    "specification":["Brand  : Apple ,IP rating : IP68 ,Display: 6.1-inch (15.5 cm diagonal) Liquid Retina HD LCD display "],
    "price":["40,999 /-"],
    "colours available":["Black,Gold,Blue"],
    "camera":["12MP TrueDepth front camera"],
    "o.s":["iOS 14"],
    "costumercare":["9874563211 or iphone@gmail.in"]
}
# Define the chatbot function
def chatbot():
    # Print a welcome message
    print("Welcome to the chatbot!")
    print("Type 'goodbye' to exit.\n")
    # Start the conversation
    while True:
        # Get the user's input
        user_input = input("You: ")
        # Check if the user wants to exit
        if user_input.lower() == "goodbye":
            print(random.choice(responses["goodbye"]))
            break
        # Look for a response in the responses dictionary
        response = responses.get(user_input.lower(), random.choice(responses["default"]))
        # Print the chatbot's response
        print("Chatbot:" , random.choice(response))
```

Call the chatbot function

chatbot()

Output =

```
Welcome to the chatbot!
Type 'goodbye' to exit.

You:  hi
Chatbot: Hello! , how can i help you..??
You:  how are you
Chatbot: I'm doing well, thanks for asking.
You:  what is this product?
Chatbot: This is iphone 11.
You:  specification
Chatbot: Brand  : Apple ,IP rating : IP68 ,Display: 6.1-inch (15.5 cm
diagonal) Liquid Retina HD LCD display
You:  variant
Chatbot: Ram : 64GB & processor : A13 Bionic
```

```
You:  colours available
Chatbot: Black,Gold,Blue
You:  camera
Chatbot: 12MP TrueDepth front camera
You:  o.s
Chatbot: iOS 14
You:  price
Chatbot: 40,999 /-
You:  costumercare
Chatbot: 9874563211 or iphone@gmail.in
You:  goodbye
Thankyou,hope we could help you out
```

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Practical no

Aim = Implement a solution for a Constraint Satisfaction Problem using Branch and Bound and Backtracking for n-queens problem or a graph coloring problem.

Code =

```
def n_queen(n):
    # Create an empty chessboard
    board = [[0 for x in range(n)] for y in range(n)]
    def is_safe(row, col):
        # Check if there is a queen in the same row
        for i in range(col):
            if board[row][i] == 1:
                return False
        # Check if there is a queen in the upper diagonal on the left side
        for i, j in zip(range(row, -1, -1), range(col, -1, -1)):
            if board[i][j] == 1:
                return False
        # Check if there is a queen in the lower diagonal on the left side
        for i, j in zip(range(row, n, 1), range(col, -1, -1)):
            if board[i][j] == 1:
                return False
        # If all conditions are satisfied, then the position is safe
        return True
    def solve(col):
        # If all queens are placed, then return True
        if col >= n:
            return True
        # Try placing a queen in each row of the current column
        for row in range(n):
            if is_safe(row, col):
                # Place the queen on the board
                board[row][col] = 1
                # Recursively solve for the remaining columns
                if solve(col + 1):
                    return True
                # If placing the queen in the current row and column doesn't lead to a solution,
                # then remove the queen from the board and try the next row
```

```
            board[row][col] = 0
        # If no queen can be placed in the current column, then return False
        return False
    # Start solving the problem from the first column
    if solve(0):
        # Print the solution if it exists
        for i in range(n):
            for j in range(n):
                print(board[i][j], end=' ')
            print()
    else:
        # If no solution exists, then print an error message
        print("No solution exists.")
x=int(input("enter an even number"));
n_queen(x)
```

output=

```
enter an even number4
0 0 1 0
1 0 0 0
0 0 0 1
0 1 0 0
>
```

```
enter an even number8
1 0 0 0 0 0 0 0
0 0 0 0 0 0 1 0
0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 1
0 1 0 0 0 0 0 0
0 0 0 1 0 0 0 0
0 0 0 0 0 1 0 0
0 0 1 0 0 0 0 0
>
```

```
enter an even number16
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0
>
```

\

Aim = Implementinng Expert System for Hospital and Medical facilities

Code =

```
def get_user_input(prompt):
    while True:
        try:
            return float(input(prompt))
        except ValueError:
            print("Please enter a valid number.")


def diagnose_disease():
    print("Welcome! This expert system will help you distinguish between diseases with similar symptoms.")
    age = get_user_input("What is the patient's age? ")
    body_temp = get_user_input("What is the patient's body temperature? ")
    oxy_level = get_user_input("What is the oxygen level? ")

    symptoms = [
        ('cough and sore throat', ['Flu', 'Common Cold']),
        ('runny nose', ['Flu', 'Common Cold']),
        ('sneezing', ['Common Cold', 'COVID-19']),
        ('headache', ['Flu']),
        ('body/muscular aches', ['Flu', 'COVID-19']),
        ('regular tiredness', ['Flu', 'COVID-19', 'Pneumonia']),
        ('fever', ['Flu', 'Common Cold', 'COVID-19']),
        ('vomiting or diarrhea', []),
        ('shortness of breath and chest pain', ['COVID-19', 'Pneumonia']),
        ('lost your sense of smell or taste', ['COVID-19'])
    ]

    disease_counts = {'Flu': 0, 'Common Cold': 0, 'COVID-19': 0, 'Pneumonia': 0}

    for symptom, diseases in symptoms:
        answer = input(f'Are you experiencing {symptom}? (Y/N) ').lower()
        if answer == 'y':
            for disease in diseases:
                disease_counts[disease] += 1
```

```
    if all(count == 0 for count in disease_counts.values()):
        print('Congratulations! You are healthy!')
    else:
        disease = max(disease_counts, key=disease_counts.get)
        print(f'Based on the symptoms, you may have {disease}.')

if __name__ == "__main__":
    diagnose_disease()
```