

# PRINCIPLES OF ARTIFICIAL INTELLIGENCE

## LABORATORY PROGRAMS

### INTRODUCTION TO CSP MAP COLORING PROGRAM:

#### SOURCE CODE:

```
import tkinter as tk
```

```
class Graph:
```

```
    def __init__(self, vertices):
```

```
        self.V = vertices
```

```
        self.graph = [[0 for column in range(vertices)] for row in range(vertices)]
```

```
    def isSafe(self, v, colour, c):
```

```
        for i in range(self.V):
```

```
            if self.graph[v][i] == 1 and colour[i] == c:
```

```
                return False
```

```
        return True
```

```
    def graphColourUtil(self, m, colour, v):
```

```
        if v == self.V:
```

```
            return True
```

```
        for c in range(1, m + 1):
```

```
            if self.isSafe(v, colour, c):
```

```
                colour[v] = c
```

```
                if self.graphColourUtil(m, colour, v + 1):
```

```
                    return True
```

```
                colour[v] = 0
```

```
        return False
```

```
    def graphColouring(self, m):
```

```
        colour = [0] * self.V
```

```
        if not self.graphColourUtil(m, colour, 0):
```

```
            return False, []
```

```
return True, colour
```

```
class Application(tk.Frame):
```

```
    def __init__(self, master=None):
```

```
        super().__init__(master)
```

```
        self.master = master
```

```
        self.pack()
```

```
        self.create_widgets()
```

```
    def create_widgets(self):
```

```
        self.run_button = tk.Button(self)
```

```
        self.run_button["text"] = "Color Graph"
```

```
        self.run_button["command"] = self.update_colors
```

```
        self.run_button.pack(side="top")
```

```
        self.quit = tk.Button(self, text="QUIT", fg="red",  
                               command=self.master.destroy)
```

```
        self.quit.pack(side="bottom")
```

```
        self.result_label = tk.Label(self, text="")
```

```
        self.result_label.pack(side="top")
```

```
    def update_colors(self):
```

```
        g = Graph(4)
```

```
        g.graph = [[0, 1, 1, 1], [1, 0, 1, 0], [1, 1, 0, 1], [1, 0, 1, 0]]
```

```
        m = 3
```

```
        success, colors = g.graphColouring(m)
```

```
        if success:
```

```
            self.result_label["text"] = "Colors assigned: " + ", ".join(map(str, colors))
```

```
        else:
```

```
            self.result_label["text"] = "No solution exists."
```

```
root = tk.Tk()
```

```
app = Application(master=root)
```

```
app.mainloop()
```

## OUTPUT:

