SUPREET GANGULY

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EXP 3- CSP Problem

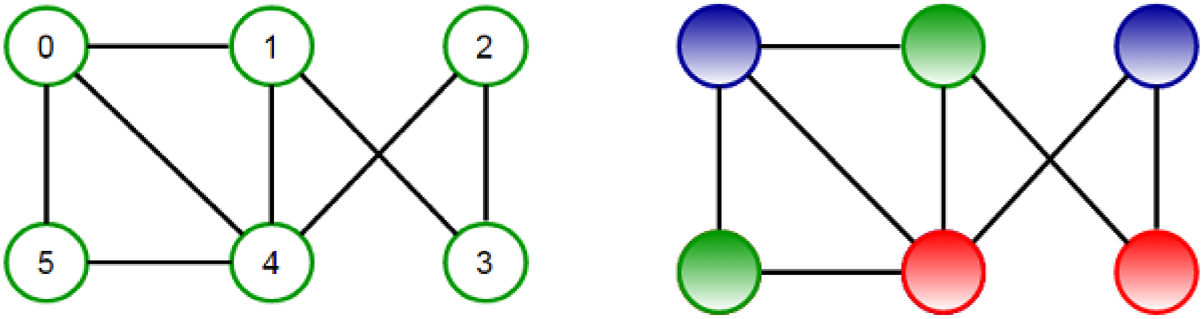
PROBLEM: (Graph Colouring Problem)

Graph coloring problem is a special case of graph labeling. In this problem, each node is colored into some colors. But coloring has some constraints. We cannot use the same color for any adjacent vertices. For solving this problem, we need to use the greedy algorithm.

Applications of Graph Coloring :

1) Making Schedule or Time Table
2) Mobile Radio Frequency Assignment
3) Map Coloring
4) Register Allocation

DIAGRAM FOR UNDERSTANDING

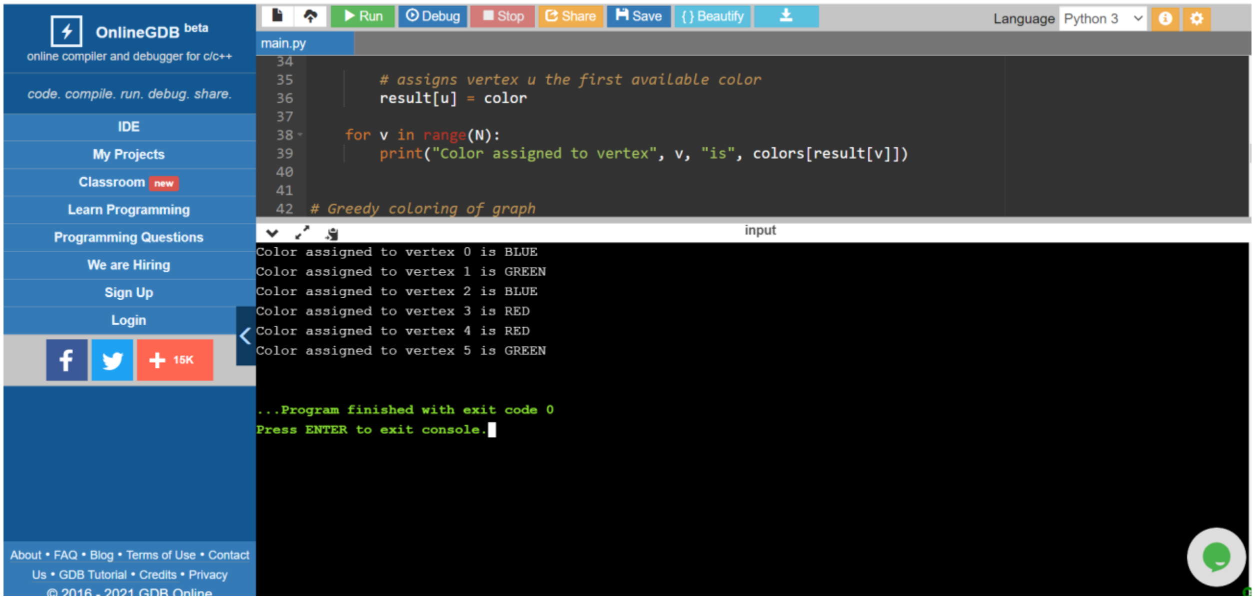


CODE

```
# class to represent a graph object
class Graph:

    # Constructor
    def __init__(self, edges, N):

        self.adj = [[] for _ in range(N)]

        # add edges to the undirected graph
        for (src, dest) in edges:
            self.adj[src].append(dest)
            self.adj[dest].append(src)


# Function to assign colors to vertices of graph
def colorGraph(graph):

    # stores color assigned to each vertex
    result = {}

    # assign color to vertex one by one
    for u in range(N):

        # set to store color of adjacent vertices of u
        # check colors of adjacent vertices of u and store in set
        assigned = set([result.get(i) for i in graph.adj[u] if i in result])

        # check for first free color
        color = 1
        for c in assigned:
            if color != c:
                break
            color = color + 1

        # assigns vertex u the first available color
        result[u] = color

    for v in range(N):
        print("Color assigned to vertex", v, "is", colors[result[v]])


# Greedy coloring of graph
if __name__ == '__main__':

    # Add more colors for graphs with many more vertices
    colors = ["", "BLUE", "GREEN", "RED", "YELLOW", "ORANGE", "PINK",
              "BLACK", "BROWN", "WHITE", "PURPLE", "VOILET"]

    #  of graph edges as per above diagram
    edges = [(0, 1), (0, 4), (0, 5), (4, 5), (1, 4), (1, 3), (2, 3), (2, 4)]

    # Set number of vertices in the graph
    N = 6

    # create a graph from edges
    graph = Graph(edges, N)
```

```
# color graph using greedy algorithm
colorGraph(graph)
```

OUTPUT



```
        # assigns vertex u the first available color
        result[u] = color

    for v in range(N):
        print("Color assigned to vertex", v, "is", colors[result[v]])


# Greedy coloring of graph
```

```
Color assigned to vertex 0 is BLUE
Color assigned to vertex 1 is GREEN
Color assigned to vertex 2 is BLUE
Color assigned to vertex 3 is RED
Color assigned to vertex 4 is RED
Color assigned to vertex 5 is GREEN


...Program finished with exit code 0
Press ENTER to exit console.
```

RESULT

The CSP problem of graph colouring is successfully executed using python language.