Homework 2

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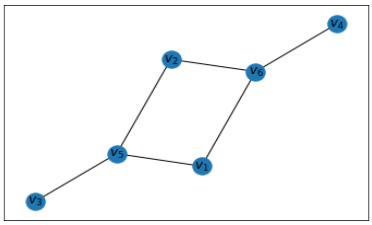
CISC5825 - Computer Algorithm

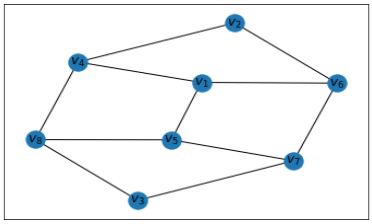
Due on Feb 13, 2023

(a) The first graph needs 3 colors. $\{color1 : v1, v2, v3; color2 : v4, v5; color3 : v6\}$. The second graph needs 5 colors. $\{color1 : v1, v2;\ color2 : v3;\ color3 : v4, v5;\ color4 : v6, v7;\ color5 : v8\}$

(b) For the first graph vertices, see the figure below: Only two colors needed.



For the second graph vertices, see the figure below: 3 colors needed.



(c) The two figures in the question are fit for this sub-question. For the first graph see 1, for the second, see 2

(d) The chromatic number for the first graph is 2. v_1, v_2, v_3, v_6 share the same color, v_4, v_5 share the same color.

The chromatic number for the second graph is 3. v_1, v_2 share the same color, v_4, v_5, v_8 share the same color, and v_3, v_6, v_7 share the same color.

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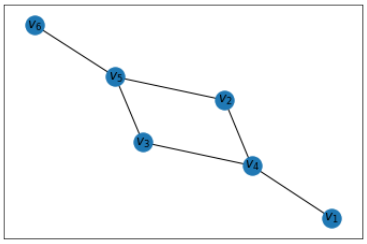

Figure 1: First Graph of question c

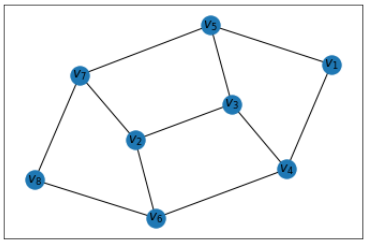

Figure 2: second graph of question c

Algorithm 1 Algorithm for coloring vertices

(e)
```
procedure GREEDY(G, newcolor)
    newcolor ← ∅
    for each uncolored vertex v of G do
        if v is not adjacent to any vertex in newcolor then
            mark v colored
            add v to newcolor
        end if
    end for
end procedure
```

Algorithm for Incompatible Turns

```
procedure GREEDY(list:T, newcolor)
    newcolor ← ∅
    for each uncolored t of T do
        if t does not have common edge to any vertex in newcolors then
            mark t colored
            add t to newcolor
        end if
    end for
end procedure
```