Discrete Lecture # 25

- Graph Coloring :
  - Graph coloring : No two adjacent vertices should have same colors
  - Chromatic Number : Least number of colors used such that no two vertices have the same color
  - Graph coloring is a concept of making sure minimum numbers of colors are used to color the graph such that adjacent vertices do not have the same color
- Chromatic number :
  - The number of colors used to color the graph
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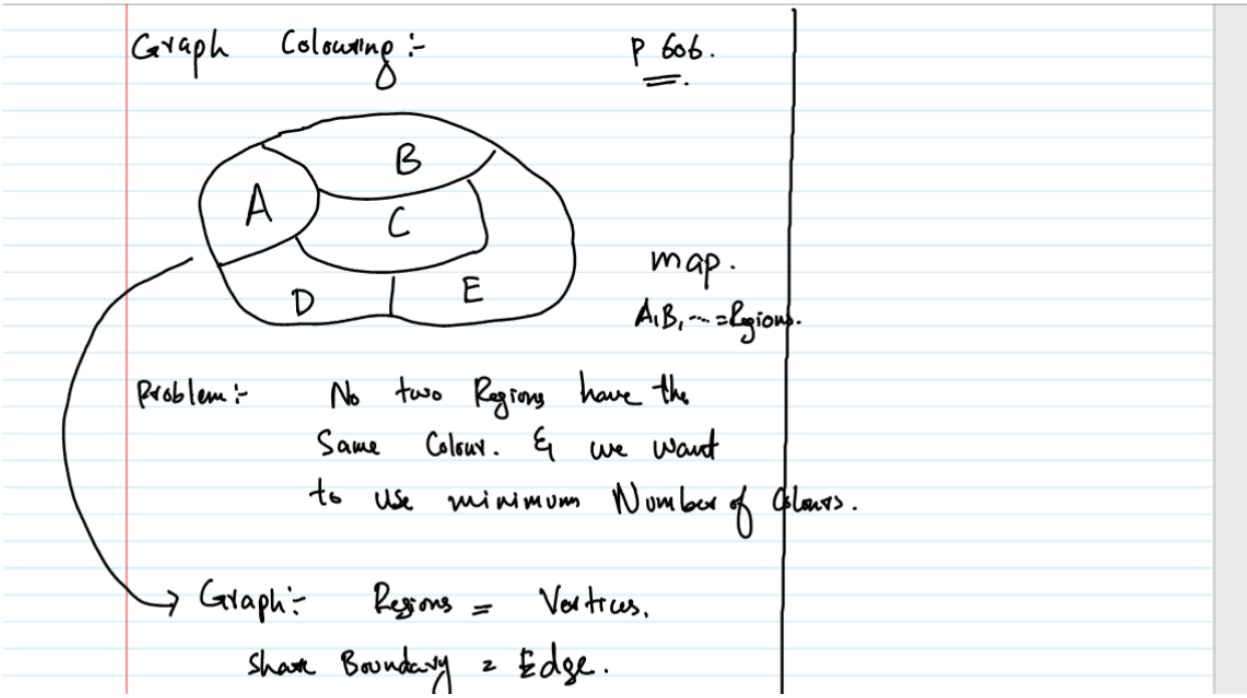
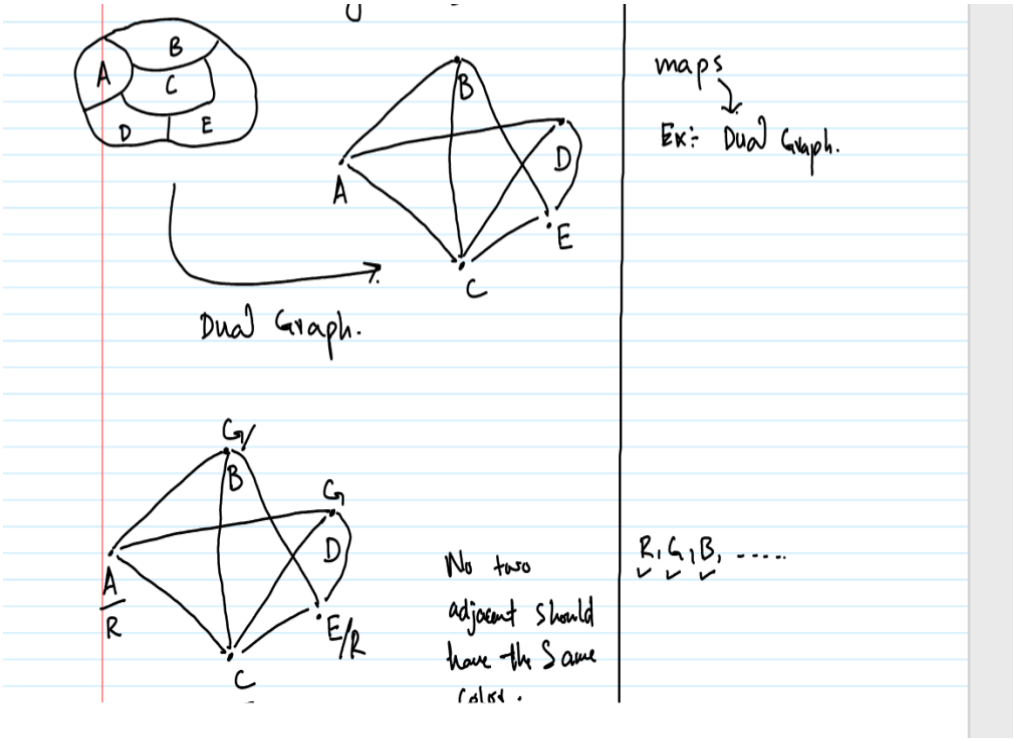
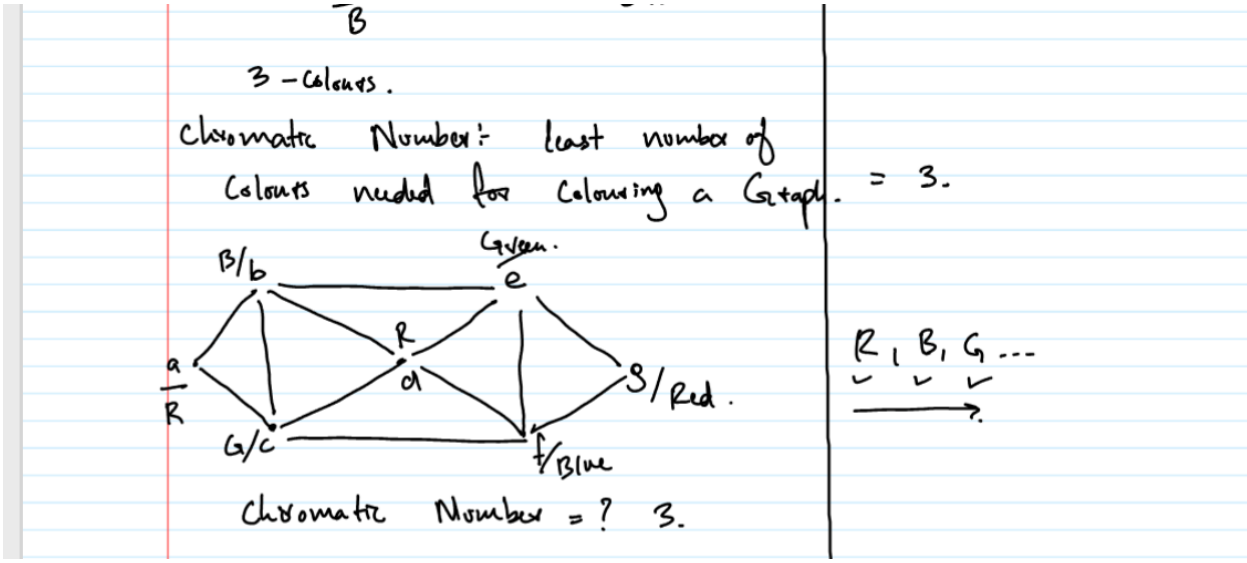
- Applications :
  - 

  - DUAL GRAPH CONCEPT :
    - Making graph from map





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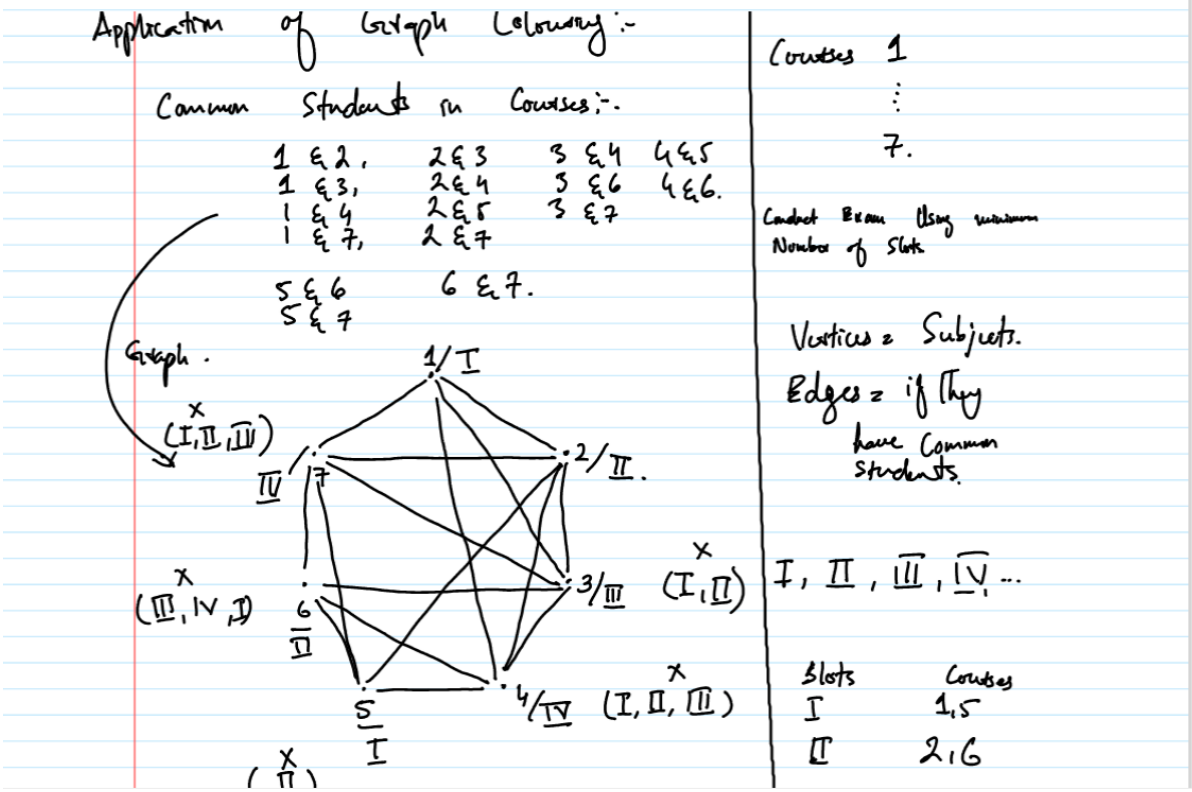
  - The above is the way to assign colors
  - Finding the chromatic number

- Bi-Partile Graph :
  - All the bi-partile graph with KM,N formation forexample K2,3 or K3,3
  - Will always have a chromatic number of 2
- Cycle :
  -

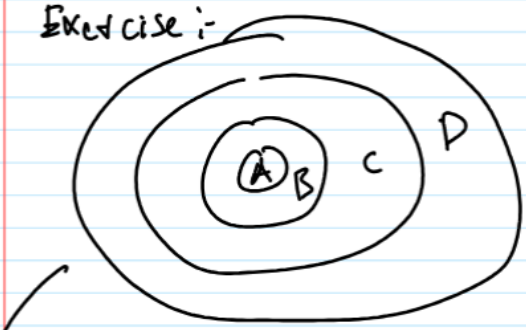
- All the C(EVEN) cycles will have a chromatic number of 2
- All the cycles with even number of vertices will have a chromatic number of 2
- ALl the C(ODD) cycles will have a chromatic number of 3
- All the cycles with odd number of vertices will have a chromatic number of 3

- Application of Graph Coloring :
  - There is a problem in a university that many students have the same classes and there is a clash of many students to not to have more than one class at the same time
  - The solution was concluded with graph coloring
  - Here colors are represented as SLOTS
  - S1 , S2 , S3 , S4……
  - First make graph from
  - Take subjects as vertices
  - Take edges as common students in a class
  - Now make an edge where you find common students in a class
  - Color the graph with slot 1 2 3 or onwards
  - You can write the slots/graph color that cannot be assigned to vertex to make it easy to color/assign slot to the vertex given there are many edges

- 

- Exercise for Making graph form map and then coloring it:
  - As you can see
    - The circles with letters :
      - Take letters as vertices
    - The boundaries of those circles
      - Take boundary as an edge of two vertices
    - Conduct a graph
    - Color the graph as taught
    - Write the chromatic number

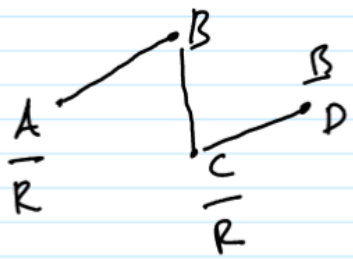
Exercise :-



Step 2 Dual Graph.

= Graph Colouring.

⇓ minimum Colours.



Chromatic = 2.

Chromatic

✓ Graph Colouring :- No two adjacent should have same Colours. ✓

✓ Chromatic Number :- least Number of colours that can be used such that no two vertices have the colours. ✓