**Research Cycle II**

**Group C3 - Handout**

**Definitions**

* Graph

A graph 𝐺=(𝑉,𝐸) is an ordered pair of finite sets where, elements of V are called vertices or nodes and elements of 𝐸⊆𝑉(2) are called edges or arcs.

* Connected graph

In the graph, there is a path from any vertex to any other vertex.

* Graph coloring

Assignment of labels or colors to each vertex of a graph such that no edge connects two identically colored vertices

* Chromatic number

Smallest number of colors needed to color the vertices of G so that no two adjacent vertices share the same color.

* Critical element & Critical Graph

Vertex or an edge is a critical element of a graph G, if its deletion would decrease the chromatic number of G. In critical graph, every vertex or edge is a critical element.

* Critical k-chromatic graph

Critical graph with chromatic number k.

* Subgraph

A graph G′ whose graph vertices and graph edges form subsets of the graph vertices and graph edges of a given graph G.

**Proposition 3.1: Every critical graph is connected.**

* What’s the contradiction ?
* Create a disconnected graph that contain different subgraphs. In that graph,
* Mark the chromatic number of each sub graph.
* Find the sub graph that contain maximum chromatic number
* Remove any edge from a sub graph except sub graph that contain maximum chromatic number

**Proposition 3.2: Every graph G contains a critical subgraph H such that χ(H) = χ(G).**

Find a critical sub graph

**Proposition 3.3: If G is a k-critical graph, then deg(V)>k-1 for all vertices V in G**

* What’s the contradiction ?