Colouring of a graph

Let G be a graph. The assignment of colours to the vertices of G, one colour to each vertex, so that adjacent vertices are assigned different colours is called vertex colouring or colouring of the graph G.

The minimum number of colours required to paint a graph G is called chromatic number of G.

To find out chromatic number of a given graph by Welsh-Powell algorithm

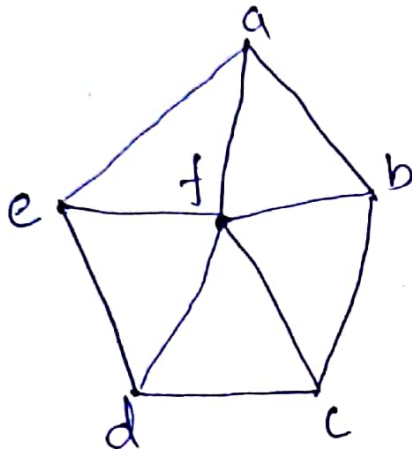**Step 1** Order the vertices of G according to decreasing degree.

Step 2 Assign first colour, say c_1, to the first vertex and then, in sequential order, assign c_1 to each vertex which is not adjacent to a previous vertex assignuns assigned c_1.

Step 3 Repeat step 2 with a second colour c_2 and subsequence of remaining non-painted vertices.

Step 4 Repeat Step 3 with a third colour c_3, then a fourth colour c_4 & so on until all vertices are coloured.

Step 5 Exit.

Example

$$deg(f) = 5$$
$$deg(a) = deg(b) = deg(c)$$
$$= deg(d) = deg(e) = 3.$$

Step 1 Ordering the vertices according to decreasing degree

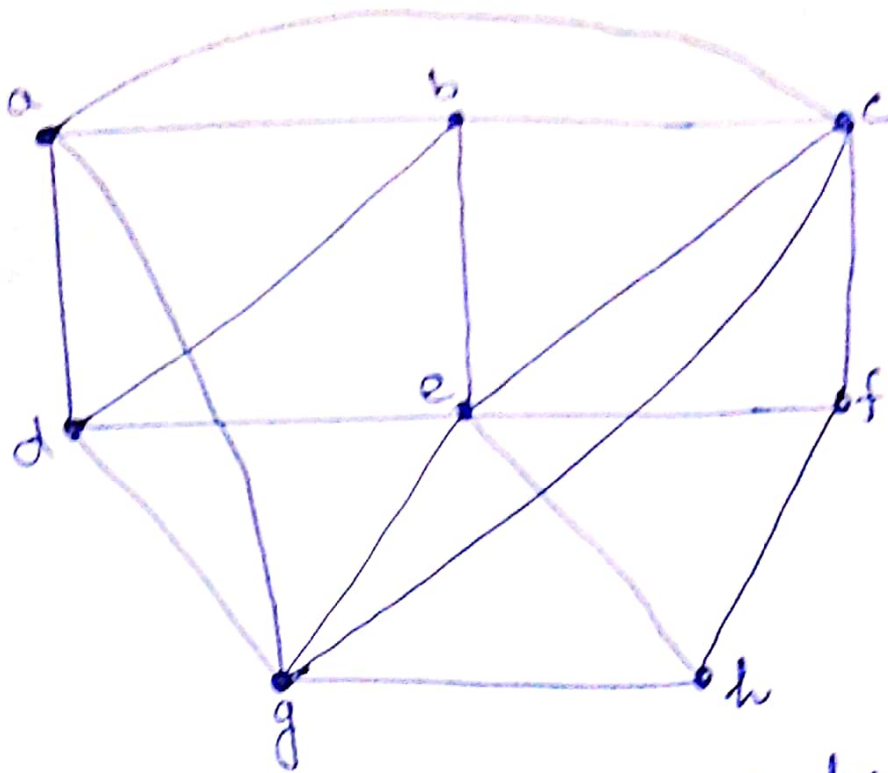$$f, a, b, c, d, e.$$

Step 2 paint f with colour c_1

Step 3 paint a, d with colour c_2

Step 4 paint b, e with colour c_3

Step 5 paint c with colour c_4.

Chromatic Number = 4.

Ordering the vertices according to decreasing degrees sequences are e, c, g, a, b, d, f, h.

Use the colour c_1 to paint e, a.

Use the colour c_2 to paint c, d, h.

Use the colour c_3 to paint g, b, f.