Answer 4 (Michael Huffman)

a)

If the node $ab$ has fewer than $K$ neighbors of any degree, we can still color after this coalesce. Before this coalesce was done, the sum of the neighbors of $a$ and $b$ is less than $K$ because this is the only way the coalesced node could have that many neighbors. Since the sum of the neighbors of $a$ and $b$ is less than $K$, the simplify phase will eliminate these insignificant degree neighbors of $a$ and $b$. Thus, we can always color nodes using the simplified conservative coalescing so there is no potential spilling being added.

b)

Simplify $a, i, j$, and $b$ so our stack becomes: $a, i, j, h$

Simplify $b$ and $c$ so our stack becomes: $a, i, j, h, b, c$
Coalesce $d$ with $f$.

Simplify $c$ and $g$ so our stack becomes: $a$ $i$ $j$ $h$ $b$ $c$ $e$ $g$.

Select color 1 for $g$, color 1 for $e$, and color 2 for $d$ and $f$.

Select color 1 for $c$, color 3 for $b$, color 3 for $h$, color 1 for $j$, color 1 for $i$, and color 3 for $a$.

Using the graph in II.3 to show this simplified test is less effective than standard conservative coalescing.

If we use Briggs criterion, we can coalesce $f$ with $g$ since $fg$ is adjacent to less than $K$ significant degree neighbors ($a$ and $d$ have degree 4).

However, we can't use the simplified test here because $fg$ is adjacent to 5 nodes. In order to use the simplified test, the node $fg$ needs to be adjacent to less than 4 nodes. Thus, there are instances where we could use standard conservative coalescing but not the simplified test so the simplified test is less effective than standard conservative coalescing.
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