

TMA 055 : Diskret Matematik (E3)

Week 6

Demonstration problems for Tuesday, Oct 7

1 (15.6.2 in Biggs) Determine the chromatic numbers of the following graphs

diagrams missing

2 (15.7.1 in Biggs) Find orderings of the vertices of the cube graph for which the greedy algorithm requires 2,3 and 4 colours respectively.

3. An *edge coloring* of a graph G is a colouring of its' edges so that no two edges sharing a common vertex get the same colour.

Prove that Petersen's graph cannot be edge-colored with fewer than 4 colours.

Demonstration problems for Thursday, Oct 9

1 (15.5.1 in Biggs) Draw all pairwise non-isomorphic trees on 6 vertices (there are 6 of them).

2. For the network below

Figure 19.2 in Biggs

- (i) find a minimal spanning tree for the undirected graph,
- (ii) use Dijkstra's algorithm to find a shortest path from s to t in the directed graph.

Further practice problems

Exercises from Chapter 16 of Biggs will be handed out on Thursday. In addition, I recommend the following exercises

1 (see 17.7.1 in Biggs) Find simple cycles¹ of lengths 5,6,8 and 9 in Petersen's graph P . On the other hand, use the result of demo exercise 3 from Tuesday above to prove that P has no Hamilton cycle.

2. Continuing exercise 2 from Thursday above, answer the following questions about the undirected, underlying graph G : (i) what is $\chi(G)$? (ii) does G have a Hamilton cycle - if so find one ? (iii) what about an Euler cycle/path ?

3 (i) There are 11 pairwise non-isomorphic trees on 7 vertices - draw them !

(ii) There are 23 pairwise non-isomorphic trees on 8 vertices - draw them !

¹i.e.: cycles in which no edge is used more than once