MAD 3305 - GRAPH THEORY PROF HUDSON

REVIEW FOR TEST #2 SPRING 2014

KEY CONCEPTS AND MAIN DEFINITIONS:

Ch.3: Non-identical spanning trees, Cayley's formula, directed (rooted) trees, traversals of binary rooted trees, Prufer codes, the center of a graph or tree.

Ch 4: Networks, capacity of an edge, legal flow, value of a flow, source-separating set of vertices, cut associated with a source-separating set, capacity of a cut, augmenting paths.

Ch 5: Euler circuits, Euler trails, Chinese postman problem, minimum postman walk, Hamilton cycles, Hamilton paths, Ore-type graphs, the dodecahedron and the Petersen graph, the closure of G, traveling salesman problem, Hamilton-connected graphs,

Ch 6: Planar graphs, planar embeddings, maximal planar graphs, K_5, $K_{3,3}$, subdivisions (refinements), homeomorphisms, pieces (fragments), the DMP theory, polyhedral graphs, the five regular polyhedral.
+ [if covered on June2]: geometric dual, self-dual graphs, dual polyhedra,

MAIN ALGORITHMS:

1. Prufer's Coding/Decoding Algorithm
2. The Inorder (etc) Traversal Algorithms
3. Huffman's tree contstruction (pgs 94-96)
4. Ford-Fulkerson Algorithm (and variations in the HW)
5. Fleury's Algorithm for finding Euler circuits
6. Hierholzer's Algorithm for finding Euler circuits
7. The DMP Planarity Algorithm,

MAIN PROOFS - ones over about 4 sentences:

1. Cayley's formula (Prufer's proof)
2. The Max Flow – Min Cut Thm
3. The Euler Circuit TFAE Thm
4. Ore's Thm
5. Euler's formula for planar graphs

MAIN THEOREMS not already listed above:

1. Huffman's Thm 3.6.1
2. The Matrix Tree Thm
3. G has an open Euler trail if and only if G has exactly two vertices of odd degree.
4. Every region of a maximal planar graph is bounded by 3 edges.
5. In any maximal planar graph with $p \geq 3$ vertices, we have $q = 3p-6$.

6. G is planar if an only if G has no subgraph which is homeomorphic to K_5 or $K_{3,3}$. (*Kuratowski's Theorem*)
7. The DMP Thm 6.2.2