MATH 443 Topics Richard Anstee

There are far too many topics for an exam and moreover a number of the questions will be from previous work. So my advice is to review what you can but I'd recommend assignments and problems as the main source. This list summarizes some main points. Detailed proofs of our theorems will not be tested.

Sum of degrees is even
Tree descriptions including tree growing idea.
A graph with all degrees even has a cycle
Euler Tours
Hall's Theorem
A regular bipartite has a perfect matching
Maximum Matching equal minimum vertex cover in a bipartite graph.
Berge's Theorem
Tutte's Matching theorem.
Max Flow Min Cut Theorem
f-factor and fractional f-factor idea. Under certain conditions, a fractional f-factor yields an f-factor. Don't dwell on this.
Menger's Theorem: both edge and vertex versions
Directed Graph decomposition into strongly connected components and acyclic connections between strongly connected components.
Any 3-connected graph with at least 5 vertices has a contractible edge.
Kuratowski's Theorem A graph is planar if no subdivision of $K_{3,3}$ or K_5.
Euler's formula for planar graphs. $V - E + F = 2$
Brook's Theorem $\chi(G) \leq \Delta(G)$ except for C_{2k+1} and K_n.
Vizing's Theorem $\chi'(G) \in \{\Delta(G), \Delta(G) + 1\}$
Shannon's Bound For multigraphs, $\chi'(G) \leq (3/2)\Delta(G)$.
Ramsey's Theorem. The existence of the Ramsey numbers $R(k_1, k_2, \ldots, k_\ell)$ the minimum number n such that any colouring of K_n with ℓ colours will have, for some $i \in \{1, 2, \ldots, \ell\}$, a clique K_{k_i} all edges of colour i.
Dirac's/Ore's Theorem Let x, y be two vertices not joined by an edge. Assume $d_G(x) + d_G(y) \geq n$. Then G has a Hamilton Cycle.
Turán's Theorem. Not for exam.