Abstract Algebra Qualifying Exam Syllabus

Groups - Including homomorphism theorems, permutation groups, automorphisms, finitely generated abelian groups, products of groups, group actions, Sylow theorems, p-groups, nilpotent groups, solvable groups, normal and subnormal series, Jordan-Hölder Theorem, special subgroups (e.g. commutator subgroup, Frattini subgroup, etc.).

Rings - Including matrix rings, polynomial rings, factor rings, endomorphism rings, rings of fractions, localization and local rings, prime ideals, maximal ideals, primary ideals, integral domains, Euclidean domains, principal ideal rings, unique factorization domains, Jacobson radical, chain conditions, modules, factor modules, irreducible modules, Artinian and Noetherian rings and modules, semisimplicity.

Fields - Including algebraic extensions, algebraic closures, normal extensions and splitting fields, separable and purely inseparable extensions, theorem of the primitive element, Galois theory, finite fields, cyclotomic extensions, cyclic extensions, radical extensions and solvability by radicals, transcendental extensions.

Linear Algebra - Including matrix theory, eigenvalues and eigenvectors, characteristic and minimal polynomials, diagonalization, canonical forms, linear transformations, vector spaces, bilinear forms, inner products, inner product spaces, duality, tensors.

Suggested References:

1. D. Dummit and R. Foote – Abstract Algebra
2. I.M. Isaacs – Algebra - A Graduate Course
3. T. Hungerford – Algebra
4. N. Jacobson – Lectures in Abstract Algebra, Vols. I, II, III
5. N. Jacobson – Basic Algebra I and II
6. MacLane and Birkhoff – Algebra
7. S. Lang – Algebra
8. M. Hall – The Theory of Groups
9. J. Rose – A Course on Group Theory
10. J. Rotman – The Theory of Groups, An Introduction
11. E. Artin – Galois Theory
12. Hoffman and Kunze – Linear Algebra