

(Topics for qualifying exam in algebra) 731 SYLLABUS

I. Set-up (over rings with unity, including noncommutative)

Modules and Homomorphism Theorems
Direct Sums and Products, Free Modules
(including Universal Mapping Properties)
Projective and Injective Modules, Divisible Modules
Exact Sequences, Split Exact Sequences, Diagram Chasing
Hom and Tensor
(including left/right module structures induced on each,
left/right exactness, behavior of projectives/injectives,
flatness, and the adjoint isomorphism)

II. Noncommutative Ring Theory

Noetherian, Artinian, Hilbert Basis Theorem
Composition Series, Length
Semisimple Rings and Modules
Maschke's Theorem
Schur's Lemma
Artin-Wedderburn Theorem
Jacobson Radical, Nakayama's Lemma
Artinian Rings
Krull-Schmidt Theorem

III. Additional Commutative Topic

Localisation

731 SOURCES

I. Set-up (over rings with unity, including noncommutative)

Text: Algebra, by Hungerford, Springer-Verlag 1974
Sections: Part IV - Sections 1, 2, 3, 4, 5

OR

Text: Advanced Modern Algebra, by Joseph J. Rotman, Prentice Hall 2002
Sections: 7.1
7.2 (product and sum/coproduct only)

7.3 (Hom material)
7.4
8.4

II. Noncommutative Ring Theory

Text: Advanced Modern Algebra, by Joseph J. Rotman, Prentice Hall 2002

Sections: 8.1,

8.2,

8.3,

6.3 (Hilbert Basis Theorem 6.42 only)

III. Additional Commutative Topic

Text: Introduction to Commutative Algebra, by Atiyah and MacDonald

Sections: Chapter 3

OR

Text: Advanced Modern Algebra, by Joseph J. Rotman, Prentice Hall 2002

Sections: 11.1