Topology Syllabus for PhD Qualify Exam

Topology Qualifier:

1. General Topology
   - I. Connectedness and Compactness
   - II Countability and Separation Axioms
   - III Metrization Theorems
   - IV Tychonoff Theorem
   - V Function Spaces
     - a Ascoli's Theorem
   - VI Baire Spaces
   - VII Quotient spaces
   - VIII Fundamental group
     - A Seifert Van Kampen Theorem
   - IX Covering spaces
     - A Existance
     - B Automorphism group of a covering space
     - C Lifting properties
   - X Simplical and CW complexes
2. Algebraic Topology
   - I. Simplical homology
   - II Singular Homology
   - III Eilenber-Steenrod Axioms
   - IV Mayer-Vietoris Sequences
   - V CW –Homology
   - VI Cohomology
   - VII Cup Products
   - VIII Hom and Tensor Products
   - IX Ext And Tor
   - X Universal Coefficient Theorems
   - XI Cech Cohomology and Steen Rod homology
   - XI Duality
     - A Poncare
     - B Alexander
     - C Lefscheta
     - D Alexander-Pontryagin
3. Differential Topology and Geometry
   - I Differentiable manifolds
     - A Vector bundles
     - B Vector Fields
     - C Differential Equations
     - D Sard's Theorem
   - II Differntial forms
     - A Stokes Theorem
     - B DeRaum Cohomology
   - III Riemannian Metrics
     - A Parallel transport and Geodesics
     - B Completeness
     - C Gauss-Bonnet theorem
     - D Connections
     - E Cartan-Hadamard theorem
     - F Curvature
     - G Variations of arc length