ARCH 631. Study Guide for Exam 2

This guide is not providing “answers” for the conceptual questions. It is a list of topical concepts and their application you should be familiar with. It is an aid to help prepare for the mid-term exam.

Covers material of Lectures 7, 8, 10, 11, 12, 13 & 14

**General: Rigid Frames**
- Rigid vs. non-rigid pinned frames
- Rigid frame behavior
- Connection types and load/moment transfer
- Moment “redistribution”
- Methods for analysis of statically indeterminate frames
- Effect of relative frame member stiffnesses
- Stiffness (relative to EI/L through Δ, or AE/L through δ)
- Sidesway
- Cantilever method with lateral forces

**General: Plates & Grids**
- Plate vs. slab
- One-way vs. two-way behavior
- Aspect ratio (with respect to bay dimensions)
- Space frame vs. grid
- Unit width for design
- Moment redistribution
- Pan joists, T sections & effective width of flange
- Drop panels
- Boundary conditions & effect on deflections / moments
- Point loads and effect on deflections / moments
- Simplified Frame Analysis & “Strip” method
- Design shear & moments (spans “integral with support”, first interior support, etc.)
- Direct design method for two-way slabs & M₀
- Solutions for large shear at space frame supports
- Moment of inertia with respect to folded plates
- Reason for stiffening of folded plates
- Live load reduction
- Thickness as a fraction of bay span (L)
- “Punching” shear at columns

**General: Membranes & Shells**
- Appropriate loads & primary stresses
- Air-supported vs. air-inflated
- Materials, durability, and punctures
- Profiles and wind effects
- Shell vs. not shell (stresses are key)
- Meridional vs. Hoop
- Shell forces vs stresses (with respect to thickness and strips)
- Tension vs. compression rings
- “Thrust”
- Buckling and “snap-through”
- Anticlastic shell properties
- Pressure vs. membrane stress
- Curvature and membrane stress
- Hyperbolic paraboloid
### General: Planning

- One-way vs. two-way systems
- “Collectors”
- Vertical & horizontal grid considerations
- Long span considerations
- Effect of loading types on system efficiency
- Options for corners, large spaces, etc.
- Integration with building services
- Fire safety and planning
- “Weakness” Areas (Tolerances, Lateral bracing, etc.)

### Reinforced Concrete

- Cast-in place, precast, prestressed (pretensioned), post-tensioned
- Constituents to make concrete
- Slump
- Behavior in compression vs. tension of concrete
- Design methodology
- 28-day compressive strength
- Term “working stress design”
- Creep
- Camber (hogging & sagging)
- “composite”
- Transformed section
- Depth of the Whitney stress
- Moment capacity (or ultimate strength) vs. nominal moment (or strength)
- Factored design moment (or shear or ...)
- Design stress in reinforcement
- Design stress in concrete
- Reinforcement grades
- Reinforcement ratio
- Effective depth vs. depth of a beam
- Under-reinforced vs. over-reinforced
- Basis of maximum steel (related to evident strain)
- Purpose of minimum reinforcement area requirement
- Why development length is necessary
- Use of Strength Design Curves (Ry)
- Purpose of stirrup requirement when concrete capacity is available
- Diagonal tension cracks
- Stirrup strength
- Shrinkage
- Concrete cover and purpose
- #3 bar (meaning of the numeral)
- Purpose of compression reinforcement
- T-section behavior and stresses in flange
- One-way joists, vs. beams, vs. girders
- “Spandrel”
- One-way slab design and “unit” strip
- One-way vs. two-way slabs
- One-way vs. two-way shear (load & strength)
- Plate vs. Flat Slab
- Openings in slabs and control of openings
- Continuous beam analysis with coefficients
- Clear span / span length
- Columns with ties vs. spirals (stresses, factors, etc.)
- Interaction diagrams (P-Δ)
- Location of maximum shear in beams
- Live load reduction
- Beam self weight relationship to material density (150 lb/ft³)
- Design vs. analysis