

53:086 Civil Engineering Materials
Review Materials for Final Examination
The University of Iowa
Spring 2008

This exam will be held in 127 Trowbridge Hall from 7:30-9:30am on Thursday, May 15th. For the exam, you will not be permitted any crib sheets, notes, or textbooks. Approximately one-third of the exam will cover subjects from the first half of the semester (see the midterm exam summary sheet posted on this same web page). The remaining two-thirds of the final exam will focus on material covered since the midterm exam. This will include (1) bituminous materials; (2) fiber-reinforced plastic composites; and (3) masonry. The specific material you're expected to know for each of these three material systems is listed below.

1. Bituminous materials

- Sources of asphalt and tar and differences between the two
- Desired aggregate characteristics in HMA
- Fundamental ideas of HMA (hot-mix asphalt) mix design
- VTM, VMA, VFA and reasonable design values
- G_{mm} , G_{mb} : what they mean, how to estimate them, and how to measure them.
- Cutbacks and emulsions
- Oxidation of asphalt cement and its effect on mechanical properties
- Common lab tests used to characterize asphalt cements (binders), and essentials of the performance grading system for asphalt cements.
- The Voigt and Maxwell models of viscoelasticity and how to compute cyclic response for a given frequency.

2. Structural Fiber Reinforced Plastic Composites

- Common types of plastics used as matrix and range of representative properties (density, stiffness, strength)
- thermosets versus thermoplastics
- Common structural fiber reinforcement materials
- Why are fibers made with such small diameters?
- Computing the directional stiffnesses/strengths of FRP composites using the rules of mixtures.
- Familiarity with the general strength, stiffness, and mass-density characteristics of FRP composites
- Where might FRPs be utilized in the civil infrastructure;
- Basic ideas behind fiber-reinforced concrete.

3. Masonry

- Absorption capacities of clay and concrete units
- Classification of clay units and concrete units (weathering vs. non-weathering units; structural vs. non-structural units)

- Dimensional stability of clay and concrete units
- Efflorescence: what it is, why it happens; how to prevent it.
- Types of masonry wall construction (hollow, cavity, multi-wythe walls, etc.)