CIVI 321 Engineering Materials Midterm Exam (25%) March 6, 2013

8:45 – 9:45 am

All questions are of equal value

No calculators allowed

Name: _____ Student ID: _____

1. The elastic modulus can be determined by a number of ways in materials exhibiting non-linear elastic behaviour. On a figure, show how to determine initial tangent modulus and tangent modulus, labelling all axes and lines. In a few words, describe how this would differ in a linear elastic material.

2. Explain using sentences, the difference between elastic rebound and creep rebound.

3. Describe the changes in mechanical behaviour as a material increases in temperature. Briefly describe a type of laboratory test can be used to determine this influence.

Answer any 3 of the following 4 questions on this page. The first three will be marked unless indicated (draw a circle around question numbers to be marked).

4. Describe the Los Angeles abrasion test. With the aid of a figure, show how the particle size distribution changes in the case of an unacceptable aggregate.

5. Describe the process of achieving the saturated surface dry state for the coarse aggregate in Lab 1. The mass in this state is necessary for determining two properties, what are they and what are the expected values?

6. What aggregate gradation would be used for the following applications? A) near a building foundation where water drainage is desired B) for asphalt pavement. Give reasons for your selection.

7. Random sampling is required for representative results; describe laboratory two methods to ensure the sampling is representative for aggregates.

Answer any 2 of the following 3 questions on this page. The first two ~~three~~ will be marked unless indicated (draw a circle around question numbers to be marked).

8. Briefly describe the process of cement manufacture from the raw material to the finished product stages, mentioning all ingredients and steps.

9. What three tests are carried out for the quality control of cement (ASTM C150)? Briefly describe them.

10. What type of cement would be most appropriate for the following applications? State the main difference between each cement selected and Type GU cement.
    a. A project where an increase in construction speed is desired.

    b. A large concrete water retention dam.

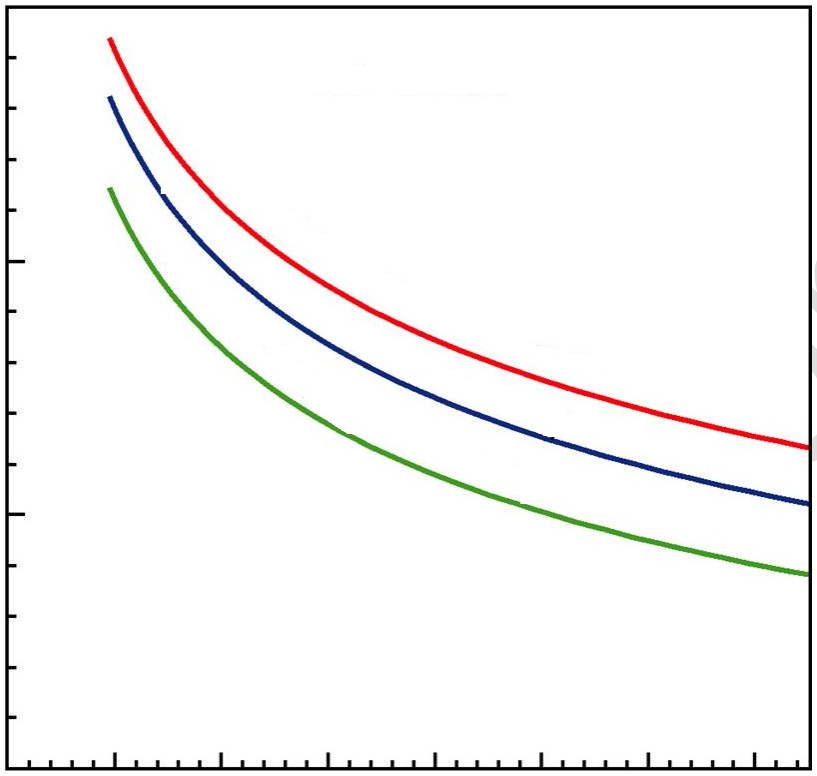
Answer any 2 of the following 3 questions on this page. The first two ~~three~~ will be marked unless indicated (draw a circle around question numbers to be marked).

11. Describe how air entrainers protect concrete from freezing and thawing. On what two factors does the amount of required entrained air depend?

12. On a figure, show how accelerators and retarders affect the strength of concrete in the first 28 days. (Assume placement temperature of 20°C. Show no admixture, retarder and accelerator as separate lines on the same figure.)

13. Describe how does the size of silica fume influence a) water requirements and b) concrete durability?

14. On the figure below regarding the determination of water content in concrete mixture design, label all axes and lines. Write a few sentences as if you were using this figure in a report to a client describing how water content was selected given a specific instance.



This page is intentionally blank. If you use it to answer questions, clearly indicating the question number as well as indicating on the original page that the answer is continued on the last page.