

Name: _____

CE 165 - EXAMINATION

Question 1 (18 points)

- What are the two basic raw materials used for the manufacture of portland cement?
- Which of the four major compounds contributes most to the strength development during the first few weeks of hydration?
- What is the main difference in compound composition of an ordinary Type I and a high early strength Type III portland cement?
- What type of cement (I or V) would one use in (a) cold-weather construction, (b) a dam, (c) sewer tank. For each cement indicate its principle characteristics.
- What type of cements would you recommend for concretes required in the following environments and why?: (a) North pole (c) San Francisco harbor
- Comparing the composition of a Type II cement with that of a Type I cement indicate which of the four major compounds would be present in a larger amount and which in a lower amount. Explain why.

Question 2 (18 points)

- Define pozzolan and give typical examples of both natural and by-product pozzolans. List the possible advantages and disadvantages that can arise from the use of pozzolanic admixtures in concrete. (10 points)
- Surfactants are commonly used by concrete construction industry for air entrainment and for water reduction. Explain the differences in chemical composition. (8 points)

Question 3 (18 points)

- Give three potential advantages of using accelerating admixtures in concrete. (6 points)
- Give three potential advantages of using water-reducing agents in concrete. (6 points)
- Is cement paste a Newtonian fluid? Please justify your answer. (6 points)

Question 4 (20 points)

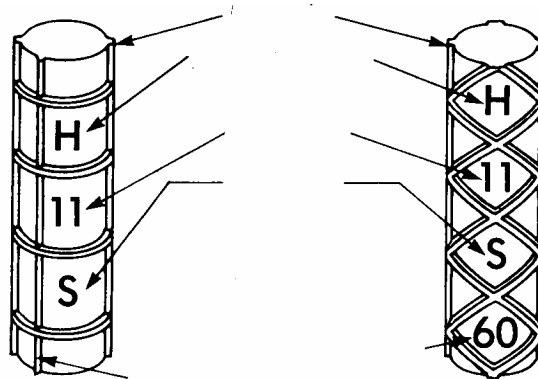
- By the use of sketches and a brief description, explain the cause or mechanism of bleeding and segregation. List two measures you can take to reduce this problem in fresh concrete. (8 points)
- What is the effect of pumping on the concrete quality? (6 points)
- What are the most important factors that determine the pumpability of a concrete mixture. (6 points)

Question 5 (22 points)

- I) A massive reinforced concrete slab is to be placed in cold weather conditions. Describe the requirements you will required regarding: a) mix proportioning, b) admixtures and c) construction practices. (12 points)
- II) List four nondestructive test method for the evaluation of concrete quality. Which one can be used as a direct substitute for determining the compressive strength of concrete? (6 points)
- III) Some concretes have a tendency to stiffen rapidly during the first 15 to 30 minutes after mixing. What test would you usually be made to determine this rapid stiffening? (4 points)

Question 6 (19 points)

- I) Identify the marks in the reinforcing bars: (10 points)



- II) What is the diameter of the bars? (3 points)
- III) How can you reduce the plastic shrinkage of concrete? (6 points)

Question 7 (18 points)

Recently, a concrete manufacturer who operates a dry batch plant (without central mixer, so that the batching is done within the ready-mix truck) complained to the admixture producer that the air content of his concretes varied within unacceptable limits, from 3 to 11%. He put the blame on the quality of the air entrainer.

The admixture salesman, after having gathered some information about the concrete producer, found out that:

- I) In order to take advantage of the two local cement companies, which competed fiercely for the regional market, the concrete manufacturer would buy his cement from the company which would offer a better deal. Usually the cement company that lost the bidding would give a much better offer next time, so the two companies rotated as a major supplier of cement.
- II) The same situation would occur with the local sand producers.
- III) To save some money, the maintenance of the concrete mixing truck has been cut back to a bare minimum.

You are requested to prepare a response to the concrete manufacturer's complaints.