**Concrete Technology Assignment**

I**nstructor**: Engr. Usama Ali  **Total Marks:** 30

**Note:** 1. Attempt all questions. Write short and to the point answers. Unnecessary gibberish will cause deduction in marks.

1. How can heat of hydration of cement be reduced? (3 marks, CLO1)

**Ans:** To lessen the heat of hydration of cement. We insert the pipe coils to circulating cold water in. There are another techniques of controlling heat evolution is to lessen the proportion of heat in hydration of cement consisting of C3A, and C3S, and use a courser fineness to produce a ‘type IV’ low heat of hydration cement. Since ‘type IV’ is generally no longer available in most location. ‘Type II’ are pozzolans or slog are used as a substitute. The use of massive mixture also facilitates to lessen the cement necessities and consequent heat by means of producing the water with the aid of demand. Hence much less cement at the equal water cement ratio.

1. Describe the effects of Tri calcium silicate on the properties of concrete. How does gypsum influence the properties of concrete? (4 marks, CLO1)

**Ans: Tri Calcium Silicate**

The addition of tricalcium silicate (C3S) to apatite cements consequences in an boom of bioactivity and improvement within the mechanical properties. However, adding a huge amounts increases the neighborhood pH at early stages, which retards the precipitation of hydroxyapatite and produces a loss of mechanical strength.

**Gypsum influence the properties of concrete**

The main function of gypsum is to regulate the setting time of cement. Gypsum has a great influence on water consumption of standard consistence and strength simultaneously. The flexural strength and the compressive strength increased gradually and tended to be stable with the increase of gypsum quantity.

1. Compare the contribution of various compounds in cement to its heat of hydration. (3 Marks, CLO1)

**Ans:** Compounds in cement mainly are tri-calcium silicate, di-calcium silicate, tri-calcium aluminate, and tetra calcium aluminate ferrite.

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| --- | --- | --- | --- |
| Compounds | Heat of hydration at the given age (cal/g) | | |
| C3S | 3 days. % | 90 days. % | 13 years % |
| C2S | 12 | 42 | 59 |
| C3A | 212 | 311 | 324 |
| C4AF | 69 | 98 | 102 |

1. What are the main stages in the manufacture of Portland cement? (4 marks, CLO1)

**Ans:** There are four stages in the manufacture of portland cement:

1. crushing and grinding the raw materials,
2. blending the materials in the correct proportions,
3. burning the prepared mix in a kiln, and
4. grinding the burned product, known as “clinker,” together with some 5 percent of gypsum (to control the time of set of the cement

The three processes of manufacture are known as the wet, dry, and semidry processes and are so termed when the raw materials are ground wet and fed to the kiln as a slurry, ground dry and fed as a dry powder, or ground dry and then moistened to form nodules that are fed to the kiln.

1. What is the difference between false set, initial set and final set? (3 marks, CLO1)

**Ans: False Set**

False set is the abnormal premature stiffening of cement within a few minutes of mixing with water.

**Causes:**

1. Dehydration of gypsum while grinding to powder with too hot clinker.
2. Semi-hydrate (CaSo4 ½ H20) or anhydrite (CaSo4) are formed and if cement is mixed with water. These CaSo4 hydrates to firm gypsum again (CaSo4 - 2H2O). Thus setting takes place with resultant stiffening of the paste.

**Initial Set**

Initial set is the time period between the time water is added to cement and time at which 1mm square section needle foils to penetrate the cement past placed in the vacates mold 5mm to 7mm from bottom to the mold.

**Final Set**

Final set is the time period between the time water is added to the cement and the time at which 1mm needle makes an impression on the past in the mold but 5mm attachment make any impression.

1. What may be the consequence of impurities in concrete? (3 marks, CLO1)

Ans: Excessive impurities in mixing water not only may affect setting time and concrete strength, but also may cause efflorescence, staining, corrosion of reinforcement, volume instability, and reduced durability.

Specifications usually set limits on chlorides, sulfates, alkalis, and solids in mixing water unless tests may be performed to work out the effect the impurity has on various properties. Relatively thin building sections involve small coarse aggregate, though aggregates up to 6 inches (150 mm) in diameter are utilized in large dams.

A continuous gradation of particle sizes is desirable for efficient use of the paste. Additionally, aggregates should be clean and free from any matter which may affect the standard of the concrete.

1. What is meant by bulking of sand? (2 Marks, CLO1)

**Ans**: Bulking Of Sand: The volume of dry sand increases due to absorption of moisture. These volume increase of dry sand is known as bulking of sand. When dry sand comes in contact with moisture, a thin film is formed around the particles, which causes them to get apart from each other.

{\displaystyle Y={\frac {F\_{2}-F}{F\_{2}-F\_{1}}}\times 100}

1. What is fineness modulus of aggregate? How do you calculate fineness modulus (4 marks, CLO1)

**Ans**: The Fineness Modulus (FM) is an empirical figure obtained by adding the total percentage of the sample of an agregate retained on each of a specified series of sieves, and dividing the sum by 100.

Fineness modulus of combined aggregates is always between the Fineness modulus of and combined modulus coarse aggregate have intermediate value. it is given by the formula

F = (F1 \* Y + F2 \* 1-Y)

{\displaystyle F=(F\_{1}\times Y+F\_{2}\times (1-Y))}Here

“{\displaystyle F}F” is resultant fineness modulus

“F1” {\displaystyle F\_{1}}F1Fchfsdfjfis fineness modulus of fine aggregate

“F2”{\displaystyle F\_{2}} is fineness modulus of coarse aggregate

“{\displaystyle Y}Y” is proportion of fine aggregate in combined aggregate

Ratio **X** of fine aggregate on coarse aggregate in combined aggregate can be found by

{\displaystyle X={\frac {F\_{2}-F}{F-F\_{1}}}}X = F2 – F/F – F1

Proportion of fine aggregate **Y** in percentage can be calculated by

{\displaystyle Y={\frac {X}{1+X}}\times 100}Y = X/1 + X \* 100

Put X value

Y = F2 – F/F2 – F1 \*100

1. Why is grading of aggregate important with regard of properties of hardened concrete? (4 marks, CLO1)

**Ans**: The grading or size distribution of aggregate is an important characteristic because it determines the paste requirement for workable concrete. The more these voids are filled, the less workable the concrete becomes, therefore, a compromise between workability and economy is necessary.