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HOMEWORK

1) What do you understand by the term durability? Compared to other considerations, how much importance should be given to durability in the design and construction of concrete structures?

2) How would you define the coefficient of permeability? Give typical values of the coefficient for (a) fresh cement pastes; (b) hardened cement pastes; (c) commonly used aggregates; (d) high-strength concretes; and (e) mass concrete for dams.

3) How does aggregate size influence the coefficient of permeability of concrete? List other factors that determine the permeability of concrete in a structure.

4) With respect to frost damage, what do you understand by the term critical aggregate size? What factors govern it?

5) Discuss the factors that influence the compressive strength of concrete exposed to a fire of medium intensity 650 C, short-duration exposure). Compared to the compressive strength, how would the elastic modulus be affected, and why?

6) List some of the common sources of sulfate ions in natural and industrial environments. For a given sulfate concentration, explain which of the following solutions would be the most deleterious and which would be the least deleterious to a permeable concrete containing a high-C3A portland cement: Na2SO4, MgSO4, CaSO4.

7) What chemical reactions are generally involved in sulfate attack on concrete? What are the physical manifestations of these reactions?

8) What is the alkali-aggregate reaction? List some of the rock types that are vulnerable to attack by alkaline solutions. Discuss the effect of aggregate size on the phenomenon.

9) With respect to the corrosion of steel in concrete, explain the significance of the following terms: carbonation of concrete, passivity of steel, electrical resistivity of concrete, state of oxidation of iron.

10) Briefly describe the measures that should be considered for the control of corrosion of embedded steel in concrete.