122

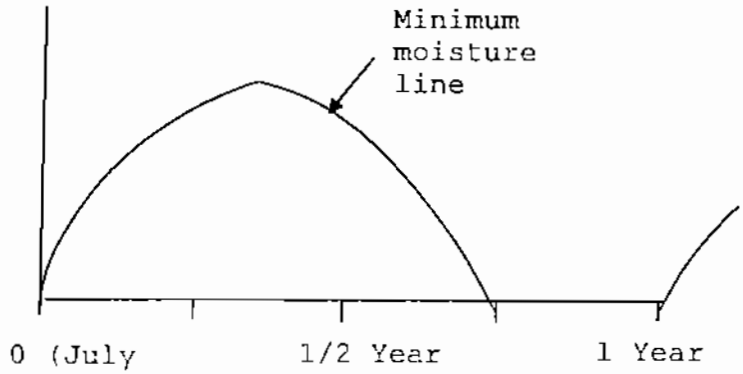
DEPARTMENT OF CIVIL ENGINEERING: IIT DELHI
CEL 768: RECENT ADVANCES IN CONSTRUCTION MATERIALS. MAJOR TEST
DURATION: 2 hours IInd Semester 2006-2007 Max. marks:=50 DATE:- 7-5-07
TIME:- 10.30 A.M -12.30 P.M Venue -IV LT2

Draw neat sketches wherever necessary

Assume missing data suitably if required.

DRAW FIGURES AND SKETCHES TO ILLUSTRATE YOUR ANSWERS.

1. Cyclic yearly moisture condition in a RCC structure for durability design is given in the diagram below.



The structure is initially dry and line corresponding to minimum moisture required for carbonation is as shown. Diagrammatically show to explain the progress of carbonation in 2nd and 3rd year. It is observed that carbonation progresses slowing compared to moisture penetration. 6

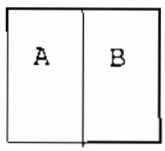
2. a) Explain with diagram the statement "*Rebar corrosion is an electro-chemical process*" 5

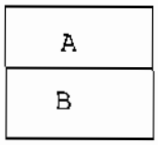
b) Explain why electrode potential at the local anode is lower than that at a local cathode. State the Nernst equation. 5

c) Obtain an expression for equilibrium potential of the following electrode reaction using Nernst equation in terms of pH given that the standard electrode potential is 0.969V and concentration of $Fe(OH)_3$ and Fe^{++} are 10^{-6} gm-mole/lit.

$$Fe(OH)_3+3H^{+}+e^{-}=Fe^{++}+3H_2O$$ 8

3. a) Shown below are two cases of repair. A is the ~~substrate~~ M15 (as measured at site) Grade concrete substrate: Repaired with a very high modulus Epoxy concrete B; Draw diagram to explain its implication in future service. Would you recommend this repair? If not what is your recommendations?





4

b) State step by step procedure and materials you are likely to use for patch repair of cracked RCC beam/slab, cracked due to rebar corrosion. 5

2C

$R = 8.134\ J/^{\circ}K$

$F = 96500$ Coulombs

Temperature = 25°C

4. A composite has a post cracking tensile strength for large strain 60% of that of the un-cracked matrix, what is ratio of moment of resistance of the composite to the un-reinforced matrix? What will be its modulus of rupture in terms of ultimate tensile strength of composite? 8

6. Explain the relevanee of (1) LOI, (2) SiO_2 (eontent) (3) CaO eontent (4) Fineness and (5) Pozzolanic activity index of pozzolana on properties of concrete prepared with the pozzolana as mineral admixture. 9