DEPARTMENT OF CIVIL ENGINEERING: IIT DELHI
CEL 768: RECENT ADVANCES IN CONSTRUCTION MATERIALS
MAJOR TEST DURATION: 2 hours IInd Semester 2009-2010 Max.marks:= 50
DATE:-05-05-2010 TIME:- 13.00-15.00 P.M. Venue- IV 323

Draw neat sketches wherever necessary
Assume missing data suitably if required.
DRAW FIGURES AND SKETCHES TO ILLUSTRATE YOUR ANSWERS.

1. Explain the concept behind Self compacting concrete and high volume fly ash concrete; give typical mix proportions for self compacting concrete and high volume fly ash concrete. 8
2. Consider fiber concrete with short randomly oriented fiber length of 10 mm and aspect ratio 100. The ultimate strength of the fiber is 1000MPa and the elastic modulus is 70 GPa. The bond shear strength of the fiber with the matrix is 4 MPa. What is the length efficiency factor for fiber when the composite is subjected to tension? 4
3. If the fibers with same diameter as above are aligned in longitudinal direction and a mat is produced with infiltration of cement based slurry in the one dimensional mesh, such that the composite behaves as fiber reinforced cement based matrix with long aligned fiber, what is the volumetric critical fiber content that would ensure post cracking tensile strength enhancement of the composite? The ultimate tensile strain of the cement based matrix is 200 micro-strain at which it cracks and elastic modulus is 50GPa. Obtain the ideal theoretical stress-strain diagram for the fiber composite when it is decided to use fiber content 1% more than the above critical fiber content. 12
4. Draw temperature versus strength curves and stress-strain diagram for fire resistant steel vis-à-vis general steel, and state the compositional difference of fire resistant steel with general steel. How can one obtain high ductile steel? 5
5. Draw diagram to explain the process of routing and sealing and state the properties those would form the basis of your selection of the repair material in this case. 5
6. Compare the role of Rice Husk Ash (RHA), Silica Fume (SF), Ground Granulated Blast Furnace Slag (GGBFS) and Fly Ash (FA) as mineral admixtures in fresh and hardened concrete. 8
7. Distinguish between free and total chloride, explain why they are different, how can one determine free and total chloride. After chloride content measurement in a concrete section, how would you infer whether the chloride is internal contamination or external ingress? State a general equation for chloride ingress in concrete explaining all the terms involved. 8

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