

DEPARTMENT OF CIVIL ENGINEERING: IIT DELHI  
CVL875: SUSTAINABLE MATERIALS AND GREEN BUILDINGS. MINOR TEST-II  
DURATION: 1.0 Hour. SECOND SEMESTER- 2022-2023. Max. Marks:=20  
DATE:- 24/03/2023 TIME:- 16.00 P.M. – 17.0 PM Venue: LH410

*All relevant charts are supplied and only chart supplied need be used.*

DRAW DIAGRAMS TO EXPLAIN YOUR ANSWER WHERE-EVER REQUIRED

**BE BRIEF AND ANSWER TO THE POINT**

ASSUME MISSING DATA SUITABLY IF REQUIRED

1. Consider a concrete with following proportions: OP Cement (C)  $370 \text{ kg/m}^3$ , Coarse Aggregate: (CA)  $1100 \text{ kg/m}^3$ , Fine aggregate  $810 \text{ kg/m}^3$  with water W; specific gravity of both aggregates is 2.7.  $W/C=0.5$ ; what is the carbon emission of this concrete/ $\text{m}^3$  when 1ton of cement is equivalent to 1 t of carbon? The concrete is admixed with Super Plasticizer which can reduce 20% Water with 2% SP for same slump, and also with Fly ash F; such that for same strength  $F/(F+C) = 0.20$ . What is carbon emission of concrete with fly ash and SP? Further how much carbon emission is possible when quality is improved to reduce the standard deviation by 20%. Approximately you can assume that for 1 MPa increase in strength, W/C shall be reduced by 0.02. 8
2. Recycled aggregates obtained from Construction and demolition wastes are used in concrete. The equivalent elastic modulus of the C&D waste aggregate is likely to be 60GPa, as opposed to 100GPa of crushed rock aggregate. Explain through Griffith's fracture concept, how strength of C&D waste aggregate concrete would vary from that with crushed rock aggregate. Can you compare relative strength of the two concretes considering other relevant factors assuming relative proportions of ingredients remain same? 8
3. What is "work index" in the context of Bond's law for crushing of aggregate, explain how it is related to power/feed rate? 4

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