BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

FIRST SEMESTER 2022 – 2023

Civil Engineering Materials (Comprehensive Examination Part A - Closed Book)

Course No: CE F230   Date: 23-12-2022 (Friday)

Duration: 120 mins.   Max. Marks: 55

Instruction: Answer the questions in the same sequence as in the question paper.

1. **Answer the following [14]:**

a) The size of an Indian standard brick including mortar is _____

b) The hydration product of Portland cement which is primarily responsible for strength in cement-based materials is _____

c) Rebound hammer test can be used for quality control test for a newly constructed structure (True/False). Windsor Probe test requires a greater number of test results as compared to rebound hammer test (True/False).

d) In a pozollanic reaction CH reacts with _____ to produce CSH. (Sulphur/Sulphur di oxide/Silicon-di-oxide, d) Sulphur tri oxide)

e) Increasing aggregate volume fraction will increase creep. (True/False). Decreasing relative humidity will increase shrinkage. (True/False)

f) The sequence of steps in manufacture of clay bricks are _____, _____, _____, and _____.

g) Efflorescence in brick masonry can cause _____.

h) Round steel bars can be used as_____ square steel bars can be used as _____, rolled steel sections can be used as _____, high-tensile steel can be used as _____

i) You have two FRC specimens A and B. The only difference in their mix-design is the type of fiber. 'A' uses Asbestos fibers. 'B' uses PP fibers. In which specimen would you find (a) stronger bond with matrix _____ (b) greater tendency for fiber pull out _____ (c) which FRC would be more ductile _____ (d) which would have greater impact resistance _____

j) Given two concrete mixes, A and B; the only difference in mix design being that concrete A is made using crushed aggregates while concrete B is made using uncrushed aggregates. Concrete __ can be expected to have higher strength and Concrete __ can be expected to have higher workability.

k) Consider three cements
   Cement 1: it has Higher C_3S, high C_2S, less C_3A percentage
   Cement 2: it has less C_3S, high C_2S, less C_3A percentage
   Cement 3: it has Higher C_3S, less C_2S, high C_3A percentage
   a) Which cement will generate the least amount of heat on hydration?
   b) Which has the highest rate of reaction?
   (I)   a) cement 1 b) cement 2
   (II)   (a) cement 2 b) cement 3
   (III)   (a) cement 3 b) cement 1
   (IV)   (a) All three will generate same amount of heat on hydration b) All three will have same rate of reaction
   (V)   (a) Cement 1 b) cement 3

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l)   While preparing mild steel through the Bessemer process, write the major steps:
   i.   _____
   ii.   _____
   iii. _____
   iv.   _____

2.   What are the ingredients of high strength concrete (HSC). Brief up advantages and disadvantages of HSC. [3]

3.   Briefly explain the load distribution in case of flexible pavement and rigid pavement [2]. What is the significance of viscosity tests on bitumen [1]?

4.   What do you mean by passivation film? What are the two main causes for its disruption [3].

5.   Write a short note on slaking of lime [2]. How is hardening of fat lime different than that of hydraulic lime? [2]

6.   Explain the general relationship between wood strength and moisture content. What is plywood? Name 4 applications of plywood. Briefly describe 3 advantages of plywood as compared to sawn lumber [2+1+1+3]

7.   Mention 2 advantages and 2 disadvantages of FRP. Describe any 3 applications of FRP in the construction industry. Describe and compare the stress-strain relationship of steel and FRP composite. What is the major difference that needs to be considered while designing a structural member using FRP? [2+3+4+1]

8.   Sieve analysis results of coarse aggregate (CA) and fine aggregate (FA) are given below. These aggregates are combined in the ratio FA: CA = 1: 2. Determine the fineness modulus and draw the grading curves for fine aggregates, coarse, and combined aggregates on the graph paper [11].

Sieve size (mm)	38	19	9.5	4.75	2.36	1.18	0.6	0.3	0.15	Pan
Wt. Retained of fine aggregate (g)	0	0	0	15	75	100	85	150	60	15
Wt. Retained of coarse aggregate (g)	25	80	280	100	15	0	0	0	0	0

-------------------------End of Part A---------------------------------