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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JUN 2023**

Semester : Semester IV&VI - 2021

Course Code : CIV2019

Course Name : Sem IV&VI - CIV2019 - Advanced Concrete Technology

Program : CIV

Date : 12-JUN-2023

Time : 9.30AM - 12.30PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
 - (ii) Question paper consists of 3 parts.
 - (iii) Scientific and non-programmable calculator are permitted.
 - (iv) Do not write any information on the question paper other than Roll Number.
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PART A

ANSWER ALL THE QUESTIONS

(5 X 4 = 20M)

1. List and explain any two factors influencing durability of concrete. (CO2) [Knowledge]
2. Discuss about the advantages and issues in High strength Concrete. (CO4) [Knowledge]
3. Write short notes on accelerators and retarders. (CO1) [Knowledge]
4. Explain in brief about rapid hardening cement. (CO1) [Knowledge]
5. Explain in brief any 2 types of shrinkage. (CO2) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(4 X 10 = 40M)

6. Compare and discuss the different types of ready mix concrete. (CO3) [Comprehension]
7. A column partly embedded in soil rich with sulphate is exposed to major damage at the soil interface. Explain the mechanism of this durability issue. Also, list out the measures to protect the concrete against this durability issue. (CO2) [Comprehension]

8. A well designed SCC mix does not segregate, has high deformability and excellent stability characteristics. Explain test carried out to determine segregation resistance. Also explain the procedure for V-funnel test along with the purpose of carrying out the test. (CO4) [Comprehension]
9. Concreting is to be carried out in Thar Desert of Rajasthan. The ambient temperature during the period of concreting is predicted to be around 45-50°C. What problems/challenges do you anticipate during concreting as an effect of the temperature. List out the precautions to be adopted and measures to overcome the problems you anticipate. (CO3) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 20 = 40M)

10. Carry out the mix proportion for an M40 Grade Self Compacting concrete with the following stipulations.

Data/ Stipulations:

- a) Grade designation : M 40
- b) Type of cement : OPC 53 grade conforming to IS 269
- c) Nominal Maximum size of aggregate : 20 mm
- d) Exposure conditions as per Table 3 & 5 of IS 456 : Very Severe (for reinforced concrete)
- e) Characteristics of SCC
 - o Slump Flow Class: SF3 (slump flow 760 mm – 850 mm)
 - o Passing ability by L box test : Ratio of h2/h1 = 0.9
 - o V- Funnel flow time (Viscosity) : Class V1 (flow time ≤ 8s)
 - o Sieve segregation resistance : SR2 (< 15percent)
- f) Degree of site control : Good
- g) Type of aggregate : Crushed angular aggregate
- h) Degree of supervision : Good
- i) Chemical admixture type : Superplasticizer (Polycarboxylate ether based)
- j) Mineral admixture : Fly ash conforming to IS 3812 (Part 1)
- k) Material Test Data:

- Cement used : OPC 53 Grade conforming to IS 269
- Specific gravity of cement : 3.15
- Specific gravity:
 - o Coarse aggregate (at SSD condition) : 2.70
 - o Fine aggregate (at SSD condition) : 2.60
 - o Fly ash : 2.20
 - o Chemical admixture : 1.08

1. Moisture content

- o Coarse aggregate : Nil

IS Sieve Sizes mm	Analysis of Coarse Aggregate Fraction		Percentage of Different Fractions			Remarks
	I (20-10 mm)	II (10 - 4.75 mm)	I 50 percent	II 50 percent	100 percent	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
20	100	100	50	50	100	Conforming of Table 7 of IS 383
10	2.8	78.3	1.4	39.15	40.55	
4.75	Nil	8.70	Nil	4.35	4.35	

2) Fine aggregate

: Conforming to grading Zone II of Table 9 of IS 383

(Materials less than 0.125 mm is 10 percent, based on sieve analysis)

Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size

(Clauses 6.1.2, 8.2.4.1 and 9.1.2)

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m ³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m ³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	–	300	0.55	M 20
iii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

(CO4) [Application]

11. Perform the mix design for an M70 Grade high strength high performance concrete with special requirements of high abrasion resistance using silica fume & GGBS.

Data/ Stipulations:

- a) Grade designation : M 70
- b) Type of cement : OPC 53 grade conforming to IS 269
- c) Silica fume : Conforming to IS 15388
- d) Maximum nominal size of aggregate : 20 mm
- e) Exposure conditions as per Table 3 & 5 of IS 456 : Moderate (for reinforced concrete)
- f) Workability : 110 mm (slump)
- g) Method of concrete placing : Pumping
- h) Degree of supervision : Good
- i) Type of aggregate : Crushed angular aggregate
- j) Chemical admixture type : Superplasticizer (Polycarboxylate ether based)
- k) Material Test Data:

- Cement used : OPC 53 Grade conforming to IS 269
- Specific gravity of cement : 3.15
- Specific gravity:
 - Coarse aggregate (at SSD condition) : 2.70
 - Fine aggregate (at SSD condition) : 2.60
 - GGBS : 2.10
 - Silica fume : 2.15
 - Chemical admixture : 1.08
- Moisture content
 - Coarse aggregate : Nil
 - Fine aggregate : Nil
- Sieve Analysis

IS Sieve Sizes mm	Analysis of Coarse Aggregate Fraction		Percentage of Different Fractions			Remarks
	I (20-10 mm)	II (10 - 4.75 mm)	I 50 percent	II 50 percent	100 percent	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
20	100	100	50	50	100	Conforming of Table 7 of IS 383
10	2.8	78.3	1.4	39.15	40.55	
4.75	Nil	8.70	Nil	4.35	4.35	

2) Fine aggregate : Conforming to grading Zone II of Table 9 of IS 383

Consider GGBS at 30% by weight of cementitious material and silica fume at 5% by weight of cementitious material

(CO4) [Application]