Paper / Subject Code: 31807 / Elective - I Advanced Concrete Technology

Seat

TE/CIVIL/SEM V/CBCS [REVISED COURSE]

29 NOV 2019

(3 Hours) [Total Marks : 80]

NOTE:

- Question No. 1 is compulsory.
- Attempt any Three out of the remaining five questions.
- Figure to the right indicates full marks.
- Draw neat sketches wherever necessary. Assume suitable data wherever required.
- Use of IS 456:2000 not allowed during examination.

Q.1 **Answer any four from the following.**

(a) State the recommended values for maximum water cement ratio for various environmental conditions as per IS 456:2000. 05

(b) Explain in brief the properties to be considered while designing structures using high strength concrete. 05

(c) State the physical and mechanical properties of the jute, sisal and coconut fibers. 05

(d) Explain the degradation by freeze and thaw in concrete 05

(e) Comment in short the acceptance criteria for concrete. 05

Q.2 (a) Define Hot weather concrete. what are the effect of hot weather on concrete? What are the precaution to be taken during hot weather concreting ?. 10

(b) Write a short note on durability and factors affecting it. Draw a flow chart stating the various types and causes of cracks before and after hardening of concrete. 10

Q.3 (a) What is non -destructive testing of concrete? What are the various tests involved? Explain any one in detail with a neat sketch? 10

(b) Explain the behavior of hardened steel fiber reinforced concrete (SFRC) under compression. Comment the significance of change in the stress – strain curve of SFRC when compared to plain and reinforced cement concrete. 10

Q.4 (a) Write a short note on Infrared thermography as non-destructive testing in evaluating and detecting of subsurface features of concrete using the following points: 10

i. Principle and working
ii. Advantages and limitations
iii. Applications with suitable examples.

(b) Explain the general arrangement of vacuum concrete process with a neat diagram? Also state the tendencies observed during extraction of water in vacuum concrete. 10

Q.5 (a) Explain the main features of the guidelines of American Concrete Institute method (ACI 211) for normal and mass concrete mix. 10

(b) Explain the characteristics of any five types of mineral admixtures with the help of the following points: 10

i. Types
ii. Classification
iii. Chemical Composition
iv. Particle characteristics

Q.6 (a) Explain properties of metallic fibre. 05

(b) Explain the significance of gel space ratio in the strength gain of concrete. Also calculate the gel space ratio and the theoretical strength of a sample made with 700 gm. of cement with 0.4 water/ cement ratio on 50 percent hydration. 05

(c) Design a concrete mix for M40 grade using fly ash with assumed standard deviation as 5 N/mm^2. Other data are given below. 10

i.	Type of Cement	OPC 53 grade
ii.	Type of Fly ash	F type conforming to IS 3812 (Part I)
iii.	Max. size of the aggregate	20mm
iv.	Minimum Cement content	320 kg/m^3
v.	Exposure Condition	Severe (RCC)
vi	Maximum water/ cement ratio	0.45
vii	Workability	75mm
viii	Method of placing and supervision	Pumping and good
ix	Chemical admixture	Superplasticizer
x	Specific gravity of cement	3.15
	Specific gravity of fly ash	2.2
	Specific gravity of coarse agg (CA)	2.75
	Specific gravity of Fine agg (FA)	2.7
xi	Water Absorption of CA and FA	0.5% and nil respectively
	Free surface moisture of CA and FA	Nil and 1% respectively
xii	Grading of CA	Conforming to Table 2 of IS 383
xiii	Grading of FA	Zone II of Table 4 of IS 383

Table 2 Maximum Water Content per Cubic Metre of Concrete for Nominal Maximum Size of Aggregate
(Clauses 4.2, A-5 and B-5)

Sl No.	Nominal Maximum Size of Aggregate	Maximum Water Content [1]
	mm	kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

NOTE — These quantities of mixing water are for use in computing cementitious material contents for trial batches.

[1] Water content corresponding to saturated surface dry aggregate.

Table 3 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate
(Clauses 4.4, A-7 and B-7)

Sl No.	Nominal Maximum Size of Aggregate	Volume of Coarse Aggregate[1] per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
	mm	Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.50	0.48	0.46	0.44
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.75	0.73	0.71	0.69

[1] Volumes are based on aggregates in saturated surface dry condition.
