

[ REVISED COURSE ]

( 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<sup>2</sup>. 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<sup>3</sup>
  - 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 <sup>1)</sup>
	mm	
(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.

<sup>1)</sup> 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 <sup>1)</sup> per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		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

<sup>1)</sup> Volumes are based on aggregates in saturated surface dry condition.