

Time: 3Hrs

Max. Marks: 80

- N.B.:
- (1) Question No.1 is compulsory
  - (2) Attempt any three from the remaining
  - (3) Draw neat sketches wherever essential
  - (4) Write answers in legible handwriting
  - (5) Assume suitable data if required

**Q.1. Solve any four out of five 5 Marks Each**

- A Explain importance of water/cement ratio of concrete.
- B What is workability of concrete? Explain any four factors affecting workability.
- C Explain light weight concrete.
- D List out laboratory tests of cement. Explain any one of them.
- E Why curing is required for fresh concrete? List out various methods of curing.

**Q.2. Solve any four out of six 5 Marks Each**

- A Explain Vacuum concrete.
- B Explain what sea water attack on concrete is.
- C What is Fiber Reinforcement concrete? List out any 4 types of fibers used in concrete.
- D What is self-compacted concrete? Explain advantages of SCC.
- E What are advantages of FRC?
- F Write short note on ACI Method of Concrete Mix Design.

**Q.3.A Solve any two out of three 10 Marks Each**

- 1 Explain step wise procedure of Concrete Mix Design by IS 10262 Method.
- 2 Write note on Types their uses of cement. (any 6)
- 3 Explain difference between Nominal Mix & Design Mix.

**Q.3.B Solve any two out of three 10 Marks Each**

- 1 What is durability? Explain factors affecting on durability of concrete.
- 2 Explain difference between Accelerators and Retarders.
- 3 Explain Difference between Grouting admixtures and Bonding Admixtures.

**Q.4. Solve any four out of six 5 Marks Each**

- A What is NDT of concrete? What are the various methods of NDT?
- B Explain Windsor probe test of NDT.
- C Explain Ground penetration Radar test of NDT.

- D What is quality control of concrete?
- E Explain acceptance criteria of concrete cubes for compressive strength.
- F Explain concrete from Industrial Waste material.

**Q.5. Solve any two out of three 10 Marks Each**

- A Explain Hot weather concreting and precautions taken during Hot weather concreting
- B Explain Cold weather concreting and precautions taken during Cold weather concreting
- C Design concrete mix of M25 grade by using IS 10262 -2009, following data.

1. Type of cement - OPC
2. Max. Nominal size of C.A. -20 mm (Angular)
3. Min. Cement content- 320 Kg/Cum
4. Max. cement content - 450Kg/Cum
5. Max. W/C Ratio - 0.55
6. Workability -75 mm slump. & 0.8 C.F.
7. Exposure condition - Mild
8. Admixture - Not recommended
9. Sp. Gravity of cement - 3.15
10. Sp. Gravity of C.A. - 2.68
11. Sp. Gravity of F.A. - 2.70
12. Fine aggregates confirming from Zone -I (IS :383)
13. Standard Deviation for M- 25 is 4.0
14. Ratio of fine aggregate to total aggregates is 0.40

**Q. 6. Solve any two out of three 10 Marks Each**

- A Explain procedure and importance to determine soundness of cement. Draw neat and labeled sketches of apparatus used to measure soundness.
- B Explain zones of fine aggregate and their importance in mix design. Write a note on gradation of aggregate with relevant curves
- C Write a note on high performance concrete w r t requirements, characteristics, merits etc.

**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	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.

<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 mm	Volume of Coarse Aggregate <sup>11</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>11</sup> Volumes are based on aggregates in saturated surface dry condition.

**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 <sup>3</sup>	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m <sup>3</sup>	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

**NOTES**

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.