

INSTRUCTIONS :

1. Question number 1 is **COMPULSORY**.
2. Attempt any **THREE** questions from the remaining **FIVE** questions.
3. Each full question carries **EQUAL** marks.
4. Numbers in parenthesis are right to indicate **FULL** marks.
5. **ASSUME** any suitable data wherever required.

Q.1 Attempt any **FIVE** of the following :

- A) Explain Bulking Phenomenon of Sand. [04M]
 B) Explain Curing of concrete. [04M]
 C) Explain 'Boiling Water Method' to determining compressive strength of accelerated-cured concrete test specimens as per IS : 9013 - 2004. [04M]
 D) Write a short note on High Performance Concrete. [04M]
 E) Write a short note on Shotcrete. [04M]
 F) Explain Concept of retrofitting in-case of UCRM load bearing structure. [04M]

- Q.2** A) Design a nominal mix of M15 concrete grade for sand of zone-II grading and maximum size of CA is 40 mm to carry-out PCC work, by using the table 9 of IS : 456 - 2000 whose clause no. is 9.3. Determine the mix proportions:
 1) by mass (weight) & 2) by ratio. It is decided to use volume batch mixing on the site, find out the volumetric proportions for the mix. Take bulk densities of cement, sand and coarse aggregate as 1450 Kg./m³, 1600 Kg./m³ and 1700 Kg./m³ respectively. [10M]
 B) Enlist the "Bogue's Compounds" of OPC. Explain their effects on properties of cement. [05M]
 C) Define Workability of Plastic concrete. Enlist factors affecting of it and explain any one of them. [05M]

Q.3 A) The concrete mix design is carried out for M25 concrete grade as per Indian Standards. The mix proportions per m³ of concrete is obtained as below :

Water (Kg.)	Cement (Kg.)	Sand (Kg.)	Coarse Aggregates (Kg.)
190	425	682	1064

Correct this proportions with explanation to suit the site conditions such that the free surface moisture of sand and crushed granite coarse aggregates are 2 % & 1 % respectively. Coarse aggregates contain 60 % of 20 mm size and 40 % of 12.5 mm size. Report your answers in weights as well as in ratios. [08M]

- B) Define coarse aggregate. Classify coarse aggregates on the basis of surface texture. How does surface texture influences on the properties of plastic as well as hardened concretes ? [07M]
 C) Define light weight concrete. Classify LWC on the basis of making method and enlist applications of acrated concrete (min. 4). [05M]

Q.4 A) Calculate approximately the ingredients of concrete, required to perform the slump cone test in the lab. If the mix proportions for M20 grade of concrete is 0.5 : 1 : 1.5 : 3. Take dimensions of slump cone is D = 200 mm, d = 100 mm and H = 300 mm. [08M]

Turn Over

- B) Define admixture. Enlist chemical admixtures and explain WRAs based on, how does they works to increase workability and strength of the concrete ? [06M]
- C) Define special concrete. Explain roller compacted concrete with field applications. [06M]
- Q.5 A) Explain with neat sketches Routing & Sealing and Stitching methods of the crack repair techniques. [08M]
- B) Define Fibre Reinforced Concrete. Explain cracking mechanism in FRC member subjected to flexure with neat labelled sketch. [07M]
- C) Define Hot Weather Concreting. What are the precautions are to be taken while concreting in hot weather condition? [05M]
- Q.6 A) Choose & write the correct options : [05M]
- a) The Flow Table Test on fresh concrete is explained in IS _____
i) IS 456 : 2000 ii) IS 1199 : 1959 iii) IS 457 : 1957 iv) IS : 383 : 1970
- b) The Flexural Tensile Strength on hardened concrete is explained in IS _____
i) IS 516 : 1959 ii) IS 10262 : 2009 iii) IS 456 : 2000 iv) IS 1199 :1959
- c) The gradation of FA & CA are given in IS _____
i) IS 2386(part 1) : 1963 ii) IS 269 : 2013 iii) IS 383 : 1970 iv) IS 455 : 1989
- d) The guidelines for Concrete Mix Design are given in IS _____
i) IS 10262 : 2009 ii) IS 10086 : 1982 iii) IS 10510 : 1983 iv) IS 10080 : 1982
- e) Air entrainment in the concrete increases _____
i) workability, ii) strength, iii) the effect of temp. Variation, iv) the unit weight.
- B) Enlist the advantages of Ready Mixed Concrete. [05M]
- C) Write a note on Rebound Hammer Test on concrete. [05M]
- D) Define High Strength Concrete and explain setting & hardening property of it. [05M]

Data for Nominal Mix Design [Q.2 A)]

Table 9 Proportions for Nominal Mix Concrete

(Clauses 9.3 and 9.3.1)

Grade of Concrete	Total Quantity of Dry Aggregates by Mass per 50 kg of Cement, to be Taken as the Sum of the Individual Masses of Fine and Coarse Aggregates, kg, Max	Proportion of Fine Aggregate to Coarse Aggregate (by Mass)	Quantity of Water per 50 kg of Cement, Max
(1)	(2)	(3)	(4)
M 5	800	Generally 1:2 but subject to an upper limit of 1:1½ and a lower limit of 1:2½	60
M 7.5	625		45
M 10	480		34
M 15	330		32
M 20	250		30

NOTE—The proportion of the fine to coarse aggregates should be adjusted from upper limit to lower limit progressively as the grading of fine aggregates becomes finer and the maximum size of coarse aggregate becomes larger. Graded coarse aggregate shall be used.

Example

For an average grading of fine aggregate (that is, Zone II of Table 4 of IS 383), the proportions shall be 1:1½, 1:2 and 1:2½, for maximum size of aggregates 10 mm, 20 mm and 40 mm respectively.