

INSTRUCTIONS: 1. Question Number 1 is COMPULSORY.

2. Answer any THREE from the remaining. 3. Each full question carries EQUAL marks.

4. ASSUME any suitable data, if needed.

1. a) What is soundness of cement? How is it tested? (04 M)
- b) Define fineness modulus. Give the practical range of fineness modulus values for coarse & fine aggregates. (04 M)
- c) Choose & write the correct option: (04 M)
- i. The heat of hydration of cement can be reduced by:
- a) Reducing the proportions of C_3A & C_3S b) Increasing the proportions of C_3A & C_3S
- c) Increasing the fineness of cement d) Both (a) & (c)
- ii. Increase in fineness modulus of aggregate indicates:
- a) Finer Grading b) Coarser grading c) Gap grading d) None of these
- iii. For a constant water-cement ratio, decrease in aggregate-cement ratio causes:
- a) Increased workability b) Decreased workability c) No workability change d) None of these
- iv. In concrete mix design, allowance for bulking of sand is necessary in case of:
- a) Volume batching only b) Weigh batching only c) Both (a) & (b) d) None of these
- d) What do you understand by Rapid Hardening Cement? Why there is rapid rate of strength gain? Under what situations, would you recommend Rapid Hardening cement on site? (04 M)
- e) Enlist the types of admixtures. Write a short note on Plasticizers. (04 M)

2. a) The following table depicts compressive strengths (MPa) of 20 number of concrete cubes tested in a laboratory. Calculate: Average strength, standard deviation & coefficient of variation. (07 M)

Sample No.	Compressive Strength	Sample No.	Compressive Strength	Sample No.	Compressive Strength	Sample No.	Compressive Strength
1	44	6	40	11	48	16	43
2	46	7	38	12	42	17	45
3	38	8	35	13	44	18	38
4	41	9	37	14	36	19	39
5	36	10	41	15	34	20	42

- b) Explain the concrete workability with reference to shape, size & grading of aggregates. (06 M)
- c) Explain creep & shrinkage of concrete. (07 M)

3. a) The concrete mix design is carried out for M30 concrete as per Indian Standard method. The mix proportion per m^3 of concrete is obtained as below:

Cement (kg)	Water (kg)	Sand (kg)	Coarse Aggregates (kg)
420	189	548	1195

- Correct this proportion to suit the site conditions such that free surface moisture of sand = 2%; water absorption of coarse aggregates = 2%. Coarse aggregates contain 60% of 20 mm size & 40% of 12.5 mm size. Report your answers in weights as well as ratios. (07 M)
- b) Write a detailed note on Non Destructive Testing by using Ultrasonic Pulse Velocity method. If a concrete gives pulse velocity of 2.5 km/second, give your comments on the quality of concrete with reference to Indian Standard specifications. (07 M)
- c) What are the advantages of using Ready Mixed Concrete? (06 M)
4. a) Discuss in detail, the factors affecting the durability of concrete. (10 M)
- b) With a neat sketch, explain Compacting Factor Test for determining the concrete workability. For the same concrete, how are the slump value & Compacting factor related? (10 M)
5. Write notes on any four: (20 M)
- High Performance Concrete
 - Self Compacting Concrete
 - Segregation & bleeding of concrete
 - Retarders used in concrete
 - Distress in concrete structures
6. a) Explain Split Tensile Test, with a neat sketch. (08 M)
- b) Discuss high volume fly ash concrete. (06 M)
- c) How many minimum concrete compressive test results are needed for a particular concrete grade on site, to fix up the value of Standard Deviation? In the absence of test results, what is the value of Standard Deviation would you adopt for designing M25 concrete mix, as per Indian Standard specifications? (03 M)
- d) The concrete mix design is carried out as per Indian Standard Method for M20 concrete. The crushing strength test results of three cubes after 28 days of curing are: 12 N/mm^2 , 20 N/mm^2 & 30 N/mm^2 . Can this result be accepted? If not, give the specific reasons. (03 M)