B.TECH/ME/7TH SEM/CIVL 4126/2021

AN INTRODUCTION TO CONCRETE TECHNOLOGY
(CIVL 4126)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable. Use of IS codes are allowed in the examination.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Tensile strength of concrete is measured by
(a) direct tension test in the universal testing machine
(b) applying compressive load along the diameter of the cylinder
(c) applying third point loading on a prism
(d) applying tensile load along the diameter of the cylinder.

(ii) The property of fresh concrete, in which the water in the mix tends to rise to the surface while placing and compacting, is called
(a) segregation (b) bleeding (c) bulking (d) creep.

(iii) The property of the ingredients to separate from each other while pacing the concrete is called
(a) segregation (b) Compaction (c) shrinkage (d) bulking.

(iv) Workability of concrete is inversely proportional to
(a) time of transit (b) water-cement ratio
(c) the air in the mix (d) size of aggregate.

(v) For complete hydration of cement the w/c ratio needed is
(a) less than 0.25 (b) more than 0.25 but less than 0.35
(c) more than 0.35 but less than 0.45 (d) more than 0.45 but less than 0.60.

(vi) Which of the following option does not come in chemical admixtures?
(a) Plasticizer (b) Fly ash
(c) Superplasticizer (d) Accelerator.

(vii) Superplasticizers can reduce water requirement for a given workability by
(a) 5-10% (b) 10-15% (c) 15-25% (d) 25-35%.

(viii) Approximate concrete mix proportion for M20 is
(a) 1:3:6 (b) 1:2:4 (c) 1:1.5:3 (d) 1:1:2.

(ix) Which type of concrete is useful for heavily reinforced members and poorly accessible areas?
(a) High performance concrete (b) Fibre reinforced concrete
(c) Self compacting concrete (d) Lightweight concrete.

(x) A small quantity of sugar in the concrete mix acts as
(a) Accelerator (b) Retarder
(c) Plasticizer (d) Superplasticizer.

Group – B

2. (a) What is meant by workability of concrete? What are the factors affecting workability of concrete? [(CO1) (Remember/LOCQ)]
(b) Explain briefly the Slump test of concrete. [(CO1) (Understand/LOCQ)]

(2 + 6) + 4 = 12

3. (a) What is curing? What is its significance? What are the various methods used for curing? [(CO2) (Remember/LOCQ)]
(b) Describe briefly the following: (i) Bleeding and (ii) Segregation. [(CO2) (Understand/LOCQ)]

(2 + 2 + 2) + (3 + 3) = 12

Group – C

4. (a) Define water-cement ratio. How does it influence concrete strength? [(CO2) (Remember/LOCQ)]
(b) Describe briefly the compression test on cubes and cylinder to measure strength of concrete. [(CO1) (Remember/LOCQ)]

(1 + 5) + 6 = 12

5. (a) What is gel space ratio? Derive the formulas of gel space ratio for full and partial hydration of concrete. [(CO2) (Remember/LOCQ)]
(b) Calculate the gel space ratio and theoretical strength of a sample of concrete made with 500 g of cement with w/c ratio as 0.55,
1. On full hydration
2. On 75% hydration. [(CO2)(Analyze/ IOCQ)]

(2 + 6) + 4 =12

Group – D

6. Design a concrete mix of grade M30 using IS 10262 : 2019 with the help of the following data:
Type of cement: PSC
Max. Nominal size of aggregate: 20 mm.
Max. Water to cementitious material ratio: 0.50

Workability: 100 mm. (slump)
Degree of site control: Good
Type of aggregate: Crushed Angular Aggregate
Fine aggregate: Conforming to Grading zone - III
Max. Cement content not including fly ash: 450 kg/m^3
Chemical admixture: Superplasticizer - normal
Specific gravity:
i.Cement : 2.88
ii. Chemical admixture: 1.145
iii. Coarse aggregate (Saturated surface dry) : 2.80
iv. Fine aggregate (Saturated surface dry) : 2.70
Water absorption:
i. Coarse aggregate : 0.5%
ii. Fine aggregate : 1.0%
Moisture content:
i. Coarse aggregate : Nil
ii. Fine aggregate : Nil [(CO3)(Create/HOCQ)]

12

7. (a) Explain how admixtures can improve the durability of concrete. [(CO1)(Evaluate/ HOCQ)]
   (b) Explain: (i) Superplasticizer (ii) GGBS. [(CO1)(Evaluate/ HOCQ)]

6 + (3 + 3) = 12

Group – E

8. (a) Explain: (i) Fibre reinforced concrete (ii) Microconcrete. [(CO5)(Evaluate/HOCQ)]
   (b) What are the reasons of deterioration of reinforced concrete structures and how it can be assessed? [(CO6)(Remember/ LOCQ)]

(3 + 3) + 6 = 12

9. (a) Explain: (i) Self compacting concrete (ii) Light weight concrete. [(CO5)(Understand/ LOCQ)]
   (b) Explain the objective of ultrasonic pulse velocity test. The pulse velocity measurements can be used to establish which parameters of concrete? [(CO6)(Remember/ LOCQ)]

(3 + 3) + (3 + 3) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	64.58%	4.17%	31.25%

Course Outcome (CO):
After the completion of the course students will be able to
1. Understand the properties of ingredients of concrete. 2. Study the behaviour of concrete at its fresh and hardened state. 3. Study about the concrete design mix. 4. Know about the

procedures in concreting. 5. Understand special concrete and their use. 6. Understand the various Non-Destructive tests.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	**Submission link:**
ME (Sec A & B)	https://classroom.google.com/w/NDA1MzAyNDQ0Mjk0/t/all