

**CONCRETE TECHNOLOGY
(CIVL 2203)**

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.

**Group - A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
 - (i) Minimum water-cement ratio required for full hydration of cement is
(a) 0.23 (b) 0.36 (c) 0.45 (d) 0.60.
 - (ii) Workability of concrete is directly proportional to
(a) aggregate - cement ratio (b) time of transit
(c) grading of aggregate (d) all of above.
 - (iii) Poisson's ratio for concrete
(a) decreases with richer mixes
(b) remains constant
(c) increases with richer mixes
(d) first increases and then decreases with richer mixes.
 - (iv) For concreting of heavily reinforced sections without vibration, the workability of concrete expressed as compacting factor value should be
(a) 0.75 - 0.80 (b) 0.80 - 0.85
(c) 0.85 - 0.92 (d) above 0.92.
 - (v) Approximate value of shrinkage strain in concrete is
(a) 0.003 (b) 0.0003 (c) 0.00003 (d) 0.03.
 - (vi) Admixtures which cause early setting and hardening of concrete are known as
(a) plasticizers (b) accelerators
(c) retarders (d) air entraining agents.
 - (vii) The total number of test strength of samples required to constitute an acceptable record for calculation of standard deviation shall
(a) not be less than 3 (b) not be more than 3
(c) not be less than 30 (d) not be more than 30.

- (viii) Which one of these is not a type of jacketing?
(a) Timber forms (b) Concrete Columns
(c) Pneumatically applied mortar (d) Precast concrete.
- (ix) The quality of concrete is considered to be medium as per Ultrasonic pulse velocity test if the pulse velocity is
(a) >4.5km/s (b) 3.5-4.5 km/s
(c) 3.0-3.5 km/s (d) 2.0-2.5 km/s.
- (x) For testing normal weight concrete, approximate impact energy required for rebound hammers (Nm) as per IS 13311(Part 2):1992 is
(a) 2.25 (b) 0.75 (c) 30.0 (d) 0.9.

Group - B

2. (a) Define Curing.
(b) Explain any two methods of curing in details. **2 + 10 = 12**
3. (a) Define workability. Name the factors affecting the workability of a fresh concrete.
(b) Describe the compacting factor test for concrete with the detailed drawing of the apparatus used. **7 + 5 = 12**

Group - C

4. (a) Define creep. What are the factors which affect creep?
(b) Draw the typical stress-strain curve for concrete. Explain its various stages. **(2 + 5) + 5 = 12**
5. (a) Define gel/space ratio of a concrete. Show the relation between strength and water/cement ratio of concrete graphically.
(b) Calculate the gel/space ratio and the theoretical strength of a sample of concrete made with 500gm of cement and with water/cement ratio 0.5, on full hydration and at 70 per cent hydration. **7 + 5 = 12**

Group - D

6. (a) What are advantages of using mineral admixtures in concrete? Give few examples of mineral admixtures.

- (b) What are set regulators? Give a schematic representation of slump loss over time to show regulation of setting of concrete.

7 + 5 = 12

7. Design a concrete mix for M40 grade for the following data.

- (i) Type of cement – OPC 43 grade
- (ii) Maximum size of aggregate -20mm
- (iii) Type of aggregate – crushed angular aggregate
- (iv) Workability-100mm slump
- (v) Exposure condition- moderate
- (vi) Method of placing concrete- Chute (Non Pumpable)
- (vii) Degree of supervision –good
- (viii) Chemical admixture- super plasticizer
- (ix) Specific gravities -coarse aggregate-2.74, fine aggregate-2.65, Cement-3.15, superplasticizer-1.145
- (ix) Water absorption coarse aggregate-0.8 percent, fine aggregate-1.2%
- (x) Free surface moisture C.A- nil, F.A- nil
- (xi) Grading of coarse aggregate conforming to Table 2 of IS 383:1970
- (xii) Grading of fine aggregate conforming to grading zone I of IS 383:1970.

12

Group – E

8. (a) What is fibre reinforced concrete? What are the factors affecting the strength of fibre reinforced concrete?

- (b) What is self compacting concrete? Name the different test conducted on self compacting concrete.

6 + 6 = 12

9. (a) What is carbonation in concrete? List the different crack repair techniques in concrete structure.

- (b) Write short note on ultrasonic pulse velocity test on determining the strength of concrete.

6 + 6 = 12