

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) W_p and W_f are the weights of a cylinder containing partially compacted and fully compacted concrete. If the compaction factor (w_p/w_f) is 0.95, the workability of concrete is
(a) extremely low (b) very low
(c) low (d) high.
 - (ii) The workability of concrete by slump test is expressed as
(a) mm^3/h (b) mm^2/h
(c) mm/h (d) mm .
 - (iii) Minimum water-cement ratio required for a workable concrete is
(a) 0.30 (b) 0.40 (c) 0.50 (d) 0.60.
 - (iv) The risk of segregation is more for
(a) wetter mix (b) dryer mix
(c) moderate mix (d) stiff mix.
 - (v) The entrained air in concrete
(a) increases workability (b) decreases workability
(c) increases strength (d) does not affect workability.
 - (vi) As per IS: 456-2000, the relationship between modulus of rupture (f_{cr}) and characteristic strength of concrete (f_{ck}) is
(a) $f_{cr} = 0.8\sqrt{f_{ck}}$ (b) $f_{cr} = 0.12\sqrt{f_{ck}}$
(c) $f_{cr} = 0.7\sqrt{f_{ck}}$ (d) $f_{cr} = 1.0\sqrt{f_{ck}}$.

- (vii) Use of accelerators in concrete
 A. shortens the setting time.
 B. Increases the early strength of concrete
 C. Increases the period of curing
 The correct answer is

(a) only (A) (b) only (B)
 (c) both (A) and (B) (d) both (B) and (C).

- (viii) The following is a tensile test of concrete
 (a) compacting factor test (b) non-destructive test
 (c) cube compressive strength test (d) splitting.

- (ix) $\sum(\text{curing period} \times \text{temperature})$ is known as
 (a) curing (b) shrinkage (c) maturity (d) strength.

- (x) For compressive strength determination, the minimum number of cubes required in a sample is
 (a) 2 (b) 3 (c) 5 (d) 6.

Group - B

2. (a) Write down the processes for manufacturing concrete. Discuss each step.
 (b) What are the limits of pollutants in water which can be used for concrete mixing according to IS 456- 2000.
 (c) Discuss: RMC.

7 + 3 + 2 = 12

3. (a) What is segregation and bleeding? Explain.
 (b) Describe compacting factor test for concrete.
 (c) Write down the name of the factors that are affecting workability of concrete.

5 + 5 + 2 = 12

Group - C

4. (a) The strength of a sample of fully matured concrete is 40 MPa. Find strength of that concrete at age of 7 days cure at an average temperature day time 22°C and night 12°C. Considered A and B for M40 concrete is 32 and 54 respectively.
 (b) Differentiate between creep and shrinkage of concrete.

6 + 6 = 12

5. (a) What are the factors that influence the strength of cement concrete?
 (b) Calculate Gel/Space ratio and theoretical strength of a sample of concrete, where weight of cement is 600 gm, w/c ratio =0.5 (considering full hydration of cement).

6 + 6 = 12

Group - D

6. (a) Define admixtures and state its application. What are the different types of admixtures? Explain any one.
 (b) Distinguish between retarders and accelerators.

8 + 4 = 12

7. Design concrete mixes of M35 (up to first trial) as per the following data:
 Type of cement – OPC 43 grade, maximum size of angular aggregate =20 mm, minimum cement content = 320 kg/m³, maximum water cement ratio = 0.45, workability = 100 mm slump, chemical admixture = super plasticizer, specific gravity of cement = 3.15, specific gravity of coarse aggregate = 2.78, specific gravity of fine aggregate = 2.7, standard deviation = 5, maximum water content per cum of concrete for 20 mm aggregate = 186 kg for slump upto 50 mm and w/c = 0.5, volume of coarse aggregate per unit volume of total aggregate for zone II fine aggregate for w/c = 0.5 is 0.62. Pumping method was applied in placing of the above concrete.

12

Group - E

8. (a) What is the role of fibre in fibre-reinforced concrete? Explain briefly.
 (b) What are the causes of distress and deterioration of concrete structure?
 (c) What is polymer concrete? What are its types?

5 + 5 + (1 + 1) = 12

9. (a) Describe the following tests:
 (i) Rebound hammer test on concrete
 (ii) Ultrasonic Pulse Velocity test on concrete
 (b) What is ferrocement? What are the applications of ferrocement?

4 + 4 + (2 + 2) = 12