

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) The maximum heat of hydration per gram of individual cement compound is due to:
(a) C_3S (b) C_2S (c) C_3A (d) gypsum.
- (ii) The compacting factor of cement concrete determines its
(a) strength (b) porosity
(c) workability (d) degree of compaction.
- (iii) Critical w/c ratio for complete hydration of cement is:
(a) 0.23 (b) 0.38 (c) 0.4 (d) 0.5.
- (iv) The most suitable test for concrete of low workability is:
(a) slump test (b) compacting factor test
(c) vee bee Test (d) air permeability test.
- (v) Air permeability method is used to determine:
(a) specific surface of cement (b) soundness of cement
(c) workability of concrete (d) flexural strength of concrete.
- (vi) As per IS 46:2000, the relationship between modulus of rupture (f_{cr}) and characteristic strength of concrete (f_{ck}) is:
(a) $0.80 \sqrt{f_{ck}}$ (b) $0.12 \sqrt{f_{ck}}$ (c) $0.7 \sqrt{f_{ck}}$ (d) $1.0 \sqrt{f_{ck}}$.
- (vii) ASTM Specification for air-entraining admixtures for concrete is:
(a) ASTM C 494 (b) ASTM C 989 (c) ASTM C 618 (d) ASTM C 260.
- (viii) Shrinkage in concrete can be reduced by using:
(a) low w/c ratio (b) less cement in concrete
(c) proper concrete mix (d) all of these.

B.TECH/CE/4TH SEM/CIVL 2203/2019

- (ix) The fundamental requirement of fibre reinforced concrete is:
- (a) uniform distribution of fibres throughout the mix
 - (b) mix should have sufficient paste to coat the fibres and aggregates
 - (c) mix should have optimum content of fibres for workability
 - (d) all of these.
- (x) In ultrasonic test for hardened concrete good quality of concrete is indicated if the pulse velocity is:
- (a) below 3.0 km/s
 - (b) between 3.0 to 3.5 km/s
 - (c) above 3.5 km/s
 - (d) below 1.5 km/s.

Group - B

- 2.(a) Explain compacting factor test with suitable diagram.
- (b) Enlist the various stages for manufacturing of concrete.
- 7 + 5 = 12**
3. Define workability of concrete. Also explain at least six factors (in details) affecting workability of concrete.

Group – C

- 4.(a) What is “bleeding” and “segregation” in concrete?
- (b) Write short notes on the following:
- (i) Rheology of fresh concrete
 - (ii) Fineness modulus
 - (iii) Soundness of cement
 - (iv) Various tests to determine the slump value of concrete.
- 4 + 8 = 12**
5. (a) How flexural tensile strength (f_{cr}) of concrete specimen is determined in the laboratory? Why is cylinder compressive strength of concrete is lower than that of cube compressive strength?
- (b) Write the relation between characteristic compressive strength, flexural strength of concrete and modulus of elasticity.
- (c) Differentiate between *shrinkage* and *creep* in concrete.
- (3 + 2) + 4 + 3 = 12**

Group – D

- 6.(a) Explain the role of water reducing admixtures in cement concrete in context with surface-active agents.
- (b) (i) Mention various admixtures used as:
 ➤ Superplasticizers
 ➤ Set retarders
 ➤ Set accelerators
 (ii) Why are chloride-based accelerators not used in reinforced and pre-stressed concrete structures?

6 + (4 + 2) = 12

- 7.(a) Write down any four principles of mix proportioning.
 Design concrete mix of M30 to suit the following data as per IS 10262:2009.
 Necessary data are given below:
 ➤ Characteristic cube strength- M30
 ➤ Type of cement- OPC
 ➤ Fine aggregate- natural river sand conforming to grade zone II
 ➤ Coarse aggregate- crushed aggregate of 20 mm size
 ➤ Specific gravity of cement- 3.14
 ➤ Specific gravity of sand- 2.63
 ➤ Specific gravity of C.A.- 2.61
 ➤ Type of exposure- mild
 ➤ Degree of quality control- very good
 ➤ Degree of workability- 0.08
- (b) Define the following (any two):
 ➤ Standard deviation
 ➤ Characteristic strength of concrete
 ➤ Nominal and design mix

10+2 =12

10 + 2 =12

Group – E

- 8.(a) Write short notes on the following:
 ➤ Fibre reinforced concrete
 ➤ Polymer impregnated concrete
 ➤ Lightweight concrete
- (b) Explain in details about lightweight concrete
- 9.(a) What is non-destructive test of concrete? Also mention why it is useful for health assessment of concrete structures.
- (b) Elaborate the ultrasonic pulse testing method of determining the strength of concrete.

(3×2) +6= 12

4 + 8 = 12