

CONCRETE TECHNOLOGY
(CIV2204)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Which compound in cement is primarily responsible for early strength development?
(a) C₃S (Tricalcium Silicate) (b) C₂S (Dicalcium Silicate)
(c) C₃A (Tricalcium Aluminate) (d) C₄AF (Tetracalcium Aluminoferrite).
- (ii) What is the ideal pH value of water suitable for concrete mixing?
(a) Less than 4 (b) Between 6 and 8
(c) Above 10 (d) Exactly 7.
- (iii) Which test is used to measure the workability of concrete?
(a) Impact Test (b) Slump Test
(c) Abrasion Test (d) Compression Test.
- (iv) Which harmful content in water causes reinforcement corrosion in concrete?
(a) Sulphates (b) Chlorides
(c) Acids (d) Alkalis.
- (v) Strength of concrete increases with
(a) Increase with w/c ratio (b) Increase in fineness of cement
(c) Decrease in size of aggregates (d) Decrease in curing time.
- (vi) The characteristic strength of concrete is
(a) Higher than average cube strength
(b) Lower than average cube strength
(c) Same as average cube strength
(d) Higher than 90% of average cube strength.
- (vii) Which of the following is a function of a retarder in concrete?
(a) Increase strength development rate (b) Reduce workability
(c) Delay the setting time of concrete (d) Entrap air bubbles in concrete.

- (viii) What is the target strength formula as per I.S. 10262 (2009)?
 (a) $f_{ck}' = f_{ck} + 1.65 \times \sigma$ (b) $f_{ck}' = f_{ck} - 1.65 \times \sigma$
 (c) $f_{ck}' = f_{ck} \times 1.65 \times \sigma$ (d) $f_{ck}' = f_{ck} + 2.5 \times \sigma$.
- (ix) Fibre reinforced concrete
 (a) is used for precast products, airport runways, blast and impact resistant structures, tunnel lining and hydraulic structures
 (b) has superior crack resistance, improved ductility, high impact resistance and toughness
 (c) uses indented, crimped or bent fibres for improved bond
 (d) all of the above.
- (x) In self compacting concrete, slump flow test is mainly used to measure?
 (a) Filling ability (b) Passing ability
 (c) Segregation resistance (d) All of them.

Fill in the blanks with the correct word

- (xi) The major compound in cement responsible for long-term strength is _____.
- (xii) The process of water rising to the surface of fresh concrete is known as _____.
- (xiii) The _____ test is performed to assess the flow ability of concrete.
- (xiv) The chemical reaction between cement and water is called _____.
- (xv) The admixture that delays the setting time of concrete is called a _____.

Group - B

2. Explain the chemical composition of cement and discuss the role of each compound in the hydration process. [[CO1](Understand/LOCQ)]
(5 + 7) = 12
3. Define workability and describe the factors affecting it. Compare the slump test, compacting factor test, and flow table test in evaluating workability. [[CO3](Understand/LOCQ)]
(6 + 6) = 12

Group - C

4. (a) Define concrete strength. State and explain in brief the factors affecting the strength of concrete? [[CO3,CO4](Analyse/HOCQ)]
 (b) Compare the various failure modes in concrete. [[CO4](Apply/IOCQ)]
8 + 4 = 12
5. (a) How creep is different from shrinkage of concrete? [[CO4](Analyse/HOCQ)]
 (b) Explain the combined effect of creep and shrinkage in concrete? [[CO4](Remember/LOCQ)]
7 + 5 = 12

Group - D

6. Explain the different types of admixtures used in concrete. Discuss the effects and uses of each type. [[C05](Remember/LOCQ)]
12
7. Design a concrete mix of grade M40 grade pumpable concrete mix having a slump of the order of 100 mm using Grade – 43 OPC conforming to IS:8112 for a reinforced concrete high rise building subjected to severe exposure conditions during its service life with the following data as per IS:10262-2009: Fine aggregate is natural river and conforming to grading zone-I (fineness modulus of 2.4), specific gravity of 2.74, moisture content of 2.0%, absorption of 1.0%, coarse aggregate crushed (angular) stone chips of 20 mm maximum nominal size conforming to IS 383 code requirements with specific gravity of 2.74, moisture content of 1.0% and absorption of 0.5%, specific gravity of cement is 3.15. Degree of quality control at site is good and Super-plasticizer conforming to IS: 9103 may be used. Assume also the following values of other data as may be required for the design. Standard deviation = 5.0 MPa, Air content = 2.0%, Maximum allowable w/c = 0.4, Minimum and maximum cement content = 320 kg/m³ and 450kg/m³ respectively. Apply any mix design methodology. [[C05](Evaluate/HOCQ)]
12

Group - E

8. (a) How is polymer concrete mixed and prepared? [[C03](Remember/LOCQ)]
(b) What are the main applications of polymer concrete? [[C04](Remember/LOCQ)]
6 + 6 = 12
9. (a) How does self-compacting concrete work? [[C03](Remember/LOCQ)]
(b) What is the difference between self-compacting concrete and conventional concrete? [[C04](Remember/LOCQ)]
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	68	4	28

