

- (f) Aggregate type : Crushed angular  
(g) Admixture : Superplasticizer (1.2% of cement)  
(h) Water reduction due to it : 25%  
(i) Sp. Gravity : CA-2.8; FA-2.7; Cement-3.15; Admixture-1.1  
(j) Water Absorption : CA - 1%  
(k) Free surface moisture : FA - 2%  
(l) Standard deviation : 5 MPa  
(m) Water content for slump : 1861 for 50 mm  
(n) Grading of FA : Zone II  
(o) Volume of CA/Total Agg. : 0.62 (w/c-0.5); Inc. by 0.01 for dec. of 0.05

(5)

Roll No. ....

Total Pages : 4

002506

Jan. 2022

**B.Tech. (Civil) - Vth SEMESTER  
Concrete Technology (PEC-CV401-1)**

Time : 90 Minutes]

[Max. Marks : 25

*Instructions :*

1. *It is compulsory to answer all the questions (1 mark each) of Part-A in short.*
2. *Answer any three questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Use of calculators is permitted*

**PART-A**

1. (a) As per IS codes, what are the minimum grades of concrete to be used for reinforced cement concrete and prestressed concrete respectively? (1)  
(b) Define clinkering temperature. How does it affect sustainability of concrete? (1)  
(c) What is the percentage bulking in the fully saturated fine aggregate? (1)

- (d) Name various slump patterns and their significance. (1)
- (e) What causes segregation in concrete? (1)
- (f) Which concrete strength parameters is usually determined indirectly? (1)
- (g) What do you understand by the "characteristic strength" of concrete? (1)
- (h) Define durability of concrete. (1)
- (i) What is the minimum number of sample test strength required to constitute an acceptable record for calculation of standard deviation for mix design as per IS 10262-2009? (1)
- (j) What do you understand by advanced cement-based composites? (1)

### PART-B

2. The raw materials to be used to produce cement yields following composition on analysis : CaO – 63%, SiO<sub>2</sub> – 20%, Al<sub>2</sub>O<sub>3</sub> – 6%, Fe<sub>2</sub>O<sub>3</sub> – 3% and SO<sub>3</sub> – 2%. Predict the heat evolved from 500 kg of such cement after 90 days. Also, calculate the percentage of heat evolved in ettringite production out of total heat produced in 90 days. It may be noted that heat of hydration in cal/g of 3CaO.SiO<sub>2</sub>, 2CaO.SiO<sub>2</sub>, 3CaO.Al<sub>2</sub>O<sub>3</sub> and 4CaO. Al<sub>2</sub>O<sub>3</sub>. Fe<sub>2</sub>O<sub>3</sub> at 90 days are 104, 42, 311 and 98 respectively.

Also,

$$C_3S = 4.07 (\text{CaO}) - 7.60 (\text{SiO}_2) - 6.72 (\text{Al}_2\text{O}_3) - 1.43 (\text{Fe}_2\text{O}_3) - 2.85 (\text{SO}_3)$$

$$C_2S = 2.87 (\text{SiO}_2) - 0.754 (3\text{CaO}.\text{SiO}_2)$$

$$C_3A = 2.65 (\text{Al}_2\text{O}_3) - 1.69 (\text{Fe}_2\text{O}_3)$$

$$C_4AF = 3.04 (\text{Fe}_2\text{O}_3) \quad (5)$$

3. (a) Estimate the flexural strength and modulus of elasticity of M40 grade concrete after 28 days. (2)
- (b) What are the advantages and disadvantages of concrete as a building material? (3)
4. What is alkali aggregate reaction? Describe in detail the factors promoting it and the measures to control it. (5)
5. (a) Define workability of concrete. Describe in detail various factors affecting it. (3)
- (b) Write a short note on Fiber Reinforced Concrete. (2)
6. Design a concrete mix for M45 grade with following specifications using IS method:
- (a) Max. nom. size of aggregate : 20 mm
- (b) Minimum cement content : 320 kg/cm<sup>3</sup>
- (c) Exposure condition : Severe
- (d) Workability : 150 mm slump
- (e) Water cement ratio : 0.45 (Max.); Experience – 0.42