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[5668]-108

S.E. (Civil Engineering) (II Sem.) EXAMINATION, 2019

CONCRETE TECHNOLOGY

(2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. Nos. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Your answers will be valued as a whole.

(v) Use of electronic pocket calculator is allowed.

(vi) Assume suitable data, if necessary.

(vii) Use of IS code 10262,456 is not allowed.

1. (a) What are the different methods of cement production ? Explain any *one* in detail with flow diagram. [6]

(b) How to measure the workability of concrete using compaction factor apparatus ? Explain the importance of measurement of workability for different types of work. [6]

P.T.O.

Or

2. (a) Differentiate gap grading and continuous grading of coarse aggregate. Explain in brief the importance of grading of fine aggregate for making good quality concrete. [6]
- (b) State the classification of admixtures as per IS 9103 and explain in brief the role of superplasticizers in concrete. [6]
3. (a) What is meant by maturity concept of concrete ? Find the strength of identical concrete at the age of 15 days when cured at an average temperature during day time at 42°C, and night time at 25°C if strength of fully matured concrete tested in laboratory is found to be 30 MPa (i.e. at the age of 28 days of curing). Take Plowman's Coefficients for Maturity Equation as $A = 21$ and $B = 61$. [6]
- (b) Write a short note on Creep and shrinkage of concrete. [6]

Or

4. (a) Explain the relation between tensile and compressive strength with graph. For the design of concrete road which strength is considered and why ? [6]
- (b) Write short notes on : [6]
- (i) Ultrasonic concrete Tester
- (ii) Self-compacting concrete.

5. Using Indian Standard recommended guidelines, design a concrete mix for a reinforced concrete structure to be subjected to the mild exposure conditions for the following requirements : [13]

(A) Stipulations for proportioning

- (i) Grade designation : M25,
- (ii) Standard deviation, $s = 4$
- (iii) Type of cement : OPC 53 grade conforming to IS 8112
- (iv) Workability: 100 mm (slump)
- (v) Degree of supervision : Good
- (vi) Exposure condition : Moderate
- (vii) Type of aggregate : Angular coarse 20 mm aggregate,
- (viii) Minimum and maximum cement content = 300 kg/m^3 and 450 kg/m^3 respectively

(B) Test data for materials

- (i) Specific gravity of cement : 3.15
- (ii) Specific gravity of :
 - (a) Coarse aggregate - 2.84
 - (b) Fine aggregates - 2.59
- (iii) Water absorption :
 - (a) Coarse aggregates - 0.59%
 - (b) Fine aggregates - 2.25%

(iv) Free surface moisture :

(a) Coarse aggregates — Nil (absorbed moisture also nil)

(b) Fine aggregates — Nil

(v) Sieve analysis

(a) Coarse aggregate :

IS Sieve Sizes (mm)	Analysis of Coarse Aggregate Fraction		Percentage of different Fractions			Remarks
	I	II	I (60%)	II (40%)	Combined (100%)	
20	100	100	60	40	100	Confirming of Table 2 of IS 383
10	0	71.2	0	28.5	28.5	
4.75		12.60		5.04	5.04	
2.36		0			0	

(b) Fine aggregate : Conforming to grading zone III

(C) Design considerations :

Table 1 : From IS 10262 : Maximum water content per cubic meter of concrete

Sr. No.	Nominal Maximum Size of Aggregate (mm)	Maximum Water Content (kg)
I	10	208
II	20	186
III	40	165

Table 2 : From IS 10262; Volume of Coarse Aggregate per Unit Volume of Total Aggregate

Sr. No.	Nominal Maximum Size of Aggregate (mm)	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
I	10	0.50	0.48	0.46	0.44
II	20	0.66	0.64	0.62	0.60
III	40	0.75	0.73	0.71	0.69

Table 3 : From IS 456; Different Exposure conditions for reinforced concrete

Sr. No.	Exposure	Minimum cement content (Kg/m ³)	Maximum free water cement ratio	Minimum grade of concrete
I	Mild	300	0.55	M20
II	Moderate	300	0.50	M25
III	Severe	320	0.45	M30
IV	Very Severe	340	0.45	M35
V	Extreme	360	0.40	M40

Or

6. (a) What are various factors affecting concrete mix design ? Explain in brief selection of Water Cement ratio in DOE method. [6]
- (b) Find out the standard deviation and coefficient of variation used in the design of concrete mixes from the following data of concrete cubes tested for compressive strength after 28 days : [7]

Sample No. (n)	Compressive Strength (x), MPa
1	21.56
2	19.56
3	18.11
4	21.33
5	22.78
6	25.22
7	24.56
8	26.11
9	21.78
10	19.00
11	20.89
12	22.11
13	18.78
14	26.22
15	19.89
16	28

7. (a) How to check the durability of concrete ? State the factors affecting durability. [5]

(b) Write notes on : [8]

(i) Sulphate attack

(ii) Retrofitting by FRP.

Or

8. (a) Explain in detail strength and durability relationship. [5]

(b) Write short notes on : [8]

(i) Effect of Carbonation on concrete

(ii) Corrosion of Reinforcement.