K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:IV
Class:SY	Program:B.Tech
Branch Code:CIV	Pattern:2023
Name of Course:Concrete Technology	Course Code:2304211
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 4page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Explain wet process of manufacturing of Portland cement .	(6)	CO1
Question No. 2			
2a)	Define workability .State and explain factors affecting workability	(6)	CO2
Question No. 3			
3a)	) Using Indian Standard recommended guidelines, design a concrete mix for a reinforced concrete structure to be subjected to the severe exposure conditions for the following requirements: **(A) Stipulations for proportioning** i) Grade designation: M30, ii) Type of cement :OPC 53 grade conforming to IS 8112 iii) Workability: 100 mm(slump) iv) Degree of supervision: Good v) Type of aggregate: Angular coarse 20mm aggregate, vi) Maximum cement content:450 kg/m3 vii) Chemical admixture type : 2 % Superplasticizer conforming to IS 9103 (**B) Test data for materials** i) Specific gravity of cement :3.15 ii) Specific gravity of admixture: 1.145 iii) Specific gravity of a) Coarse aggregate - 2.74 b) Fine aggregate - 2.74 iv) Water absorption a) Coarse aggregates - 0.5% b) Fine aggregates — 1.00% v) Free surface moisture a) Coarse aggregates — Nil(absorbed moisture also nil) b) Fine aggregates — Nil	(8)	CO5

(C) Design considerations:

Table 1: From IS 10262 Standard Deviation

Sl No.	Grade of Concrete	Value of X
(1)	(2)	(3)
i)	M10, M15	5.0
ii)	M20, M25	5.5
iii)	M30, M35, M40, M45, M50, M55, M60	6.5
iv)	M65 and above	8.0

Table 2: From IS 10262; Maximum Water Content per Cubic Metre of Concrete for Nominal Maximum Size of Aggregate

Sl No.	Nominal Maximum Size of Aggregate mm	Water Content[1)] kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

[1)]Water content corresponding to saturated surface dry aggregate.

Table 3: From IS 10262; Volume of Coarse Aggregate per Unit Volume of Total Aggregate for water cement ratio 0.5

Sl 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
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.54	0.52	0.50	0.48
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.73	0.72	0.71	0.69

Table 4: From IS 456, Different Exposure conditions for reinforced concrete for 20mm size aggregate

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m³	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete
1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Mild	220	0.60	-	300	0.55	M 20
iii)	Moderate	240	0.60	M 15	300	0.50	M 25
iii)	Severe	250	0.50	M 20	320	0.45	M 30
iv)	Very severe	260	0.45	M 20	340	0.45	M 35
v)	Extreme	280	0.40	M 25	360	0.40	M 40

OR

3b) 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 : (8) CO5

(A) Stipulations for proportioning

(i) Grade designation : M20,

(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) Minimumand maximum cement content = 300 kg/m3 and450 kg/m3 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

(C) Design considerations :

Table 1 ,Table 2 Table 3and Table 4 can be refered from Question 3a.

3c) What are the various factors affecting concrete mix design? (8) CO5

OR

3d) Explain DOE method of mix design in brief . (8) CO5

Question No. 4

4a) What are the special problems encountered in hot weather concreting? How are they rectified? (8) CO3

OR

4b) Define Ferrocement. Explain the basic concepts in forming ferrocement composites used in construction industry? (8) CO3

4c)	Write short notes on Fiber Reinforce Concrete .	(8)	CO3

OR

4d)	Write short notes on Self compacting concrete .	(8)	CO3

Question No. 5

5a)	Explain in detail permeability and factors affecting permeability of the concrete.	(8)	CO4

OR

5b)	Explain how the control of corrosion of steel is done?	(8)	CO4
5c)	Write short note on Carbonation of concrete and its determination .	(8)	CO4

OR

5d)	Write short note on Sulphate Attack .	(8)	CO4

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