

G.R. No.

Paper code - U219-115 (BE-F&FS)

Dec. 2019/ENDSEM/ FS / Backlog Exam

S. Y. B. TECH. (CIVIL ENGINEERING) - Sem - I**COURSE NAME: CONCRETE TECHNOLOGY (Backlog)****COURSE CODE: CVUA21175****(PATTERN 2017)**

Time: [2 Hours]

[Max. Marks: 50]

**(\*) Instructions to candidates:**

- 1) Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed
- 4) Use suitable data where ever required

Q.1) a) Differentiate Dry Process & Wet Process of manufacturing of Portland cement. [6 marks]

**OR**

b) Describe the hydration reaction of important Bogues' compounds indicating the products of hydration. [6 marks]

Q.2) a) What are the stages of transformation of fresh concrete to hardened concrete? Explain. [6 marks]

**OR**

b) Compare light weight concrete & high density concrete. [6 marks]

Q.3) a) What are the special methods of making high strength concrete? [6 marks]

**OR**

b) Differentiate between high performance concrete and geo-polymer concrete. [6 marks]

Q.4) a) What is the use of chute in concreting? [4 marks]

**OR**

b) Explain the various methods of batching in concrete. [4 marks]

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

i) Design Stipulations



Characteristic strength at 28 days – 20MPa, Maximum nominal size of aggregate –20mm, aggregate type is Angular (crushed), Degree of workability is Medium 80 mm slump. Degree of quality control is good, Grading zone of sand is I.

ii) Characteristics of the Materials

Cement:

Type of cement is OPC, its specific gravity is 2.95 and its Bulk density is 1450kg/m<sup>3</sup>.

Aggregate	Fine Aggregate	Coarse Aggregate
Specific Gravity	2.58	2.89
Bulk Density (kg/m <sup>3</sup> )	1500	1440
Free Surface Moisture	2.0	1.0
Fine Modulus	2.2	6.0

Calculate Target Mean Strength, Water-cement ratio, Water & Cement Contents.

[6marks]

b) From the above Q 5 a, using same data Calculate Quantity of Fine Aggregate & Coarse Aggregates. [4 marks]

c) Explain the factors that influence the choice of mix design. [4 marks]

**OR**

Q.6) a) Using Indian Standard recommended guidelines, design a concrete mix for a structure to be subjected to the mild exposure conditions for the following requirements:

i) Design Stipulations

Characteristic strength at 28 days – 15MPa, Maximum nominal size of aggregate –20mm, aggregate type is Angular (crushed), Degree of workability is Medium (75 mm slump. Degree of quality control is good, Grading zone of sand is III.

ii) Characteristics of the Materials

Cement:

Type of cement is OPC 33 grade, its specific gravity is 3.15 and its Bulk density is 1450kg/m<sup>3</sup>.

Aggregate	Fine Aggregate	Coarse Aggregate
Specific Gravity	2.60	2.75
Bulk Density (kg/m <sup>3</sup> )	1700	1800
Free Surface Moisture	2.0	1.0
Fine Modulus	2.2	6.0

Calculate Target Mean Strength, Water-cement ratio, Water & Cement Contents. [6marks]

b) From the above Q 6 a, using same data Calculate Quantity of Fine Aggregates & Coarse Aggregates. [4 marks]

c) Classify various factors affecting proportioning of concrete mixes? [4 marks]



- Q.7) a) State & Explain factors affecting Permeability of Concrete [6 marks]  
 b) What are the various types of chemical attacks encountered by concrete? [4 marks]  
 c) Explain the methods of reinforced concrete repair techniques. [4 marks]

OR

- Q.8) a) Write short note on Permeability of Concrete. [6 marks]  
 b) Explain the procedure for the repair of concrete floors. [4 marks]  
 c) What is jacketing? What are the different types of jacketing? [4 marks]

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**Table 1 Assumed Standard Deviation**  
 (Clauses 3.2.1.2, A-3 and B-3)

Sl No.	Grade of Concrete	Assumed Standard Deviation N/mm <sup>2</sup>
(1)	(2)	(3)
i)	M 10	3.5
ii)	M 15	
iii)	M 20	4.0
iv)	M 25	
v)	M 30	5.0
vi)	M 35	
vii)	M 40	
viii)	M 45	
ix)	M 50	
x)	M 55	

**Table No.1**

**Table 2 Maximum Water Content per Cubic Metre of Concrete for Nominal Maximum Size of Aggregate**  
 (Clauses 4.2, A-5 and B-5)

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

**Table No. 2**



## Step 5

Change in condition	Correction in Water content (%)	Correction in sand %
For Sand of Zone I, III & IV	0	+ 1.50 for Zone I - 1.50 for Zone III - 3.0 for Zone IV
Inc or Dec in CF by 0.1 (25 mm slump)	$\pm 3$	0
Inc or dec in W/C by 0.05	0	$\pm 1$

**Table No. 3**

## Durability Criteria as per IS 456- 2000

Exposure	Plain Concrete			Reinforced Concrete		
	Min. Cement	Max w/c	Min grade	Min. Cement	Max w/c	Min grade
Mild	220 kg/m <sup>3</sup>	0.60	--	300 kg/m <sup>3</sup>	0.55	M 20
Moderate	240 kg/m <sup>3</sup>	0.60	M 15	300 kg/m <sup>3</sup>	0.50	M 25
Severe	250 kg/m <sup>3</sup>	0.50	M 20	320 kg/m <sup>3</sup>	0.45	M 30
V. Severe	260 kg/m <sup>3</sup>	0.45	M 20	340 kg/m <sup>3</sup>	0.45	M 35
Extreme	280 kg/m <sup>3</sup>	0.40	M 25	360 kg/m <sup>3</sup>	0.40	M 40

**Table No. 4**

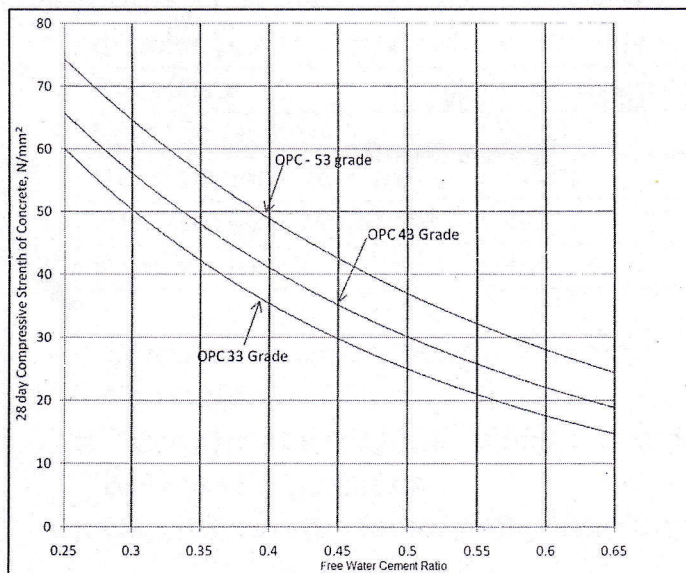
## Step 3

Estimate the air content for maximum size of aggregate used

Approximate Entrapped Air Content

Max. size of Aggregate (mm)	Entrapped air as % of concrete
10	3.0
20	2.0
40	1.0

**Table No. 5**



**Figure No. 1**

**Table 3 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate**  
(Clauses 4.4, A-7 and B-7)

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate <sup>1)</sup> 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	0.50	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 No. 6**