

# University of Mumbai

## Examination 2020

Examinations Commencing from 23<sup>rd</sup> December 2020 to 6<sup>th</sup> January 2021 and from 7<sup>th</sup> January 2021 to 20<sup>th</sup> January 2021

Program: Civil Engineering

Curriculum Scheme: Rev2016

Examination: TE

Semester V

Course Code: CEDLO 5062

Course Name: Advanced Concrete technology

Time: 2 hour

Max. Marks: 80

<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	Which chemical composition has highest content in OPC?
Option A:	Alumina
Option B:	Silica
Option C:	Lime
Option D:	Iron Oxide
2.	Which cement contains high percentage of C3S and less percentage of C2S?
Option A:	Rapid Hardening Cement
Option B:	Ordinary Portland Cement
Option C:	Quick Setting Cement
Option D:	Low Heat Cement
3.	Which apparatus is generally used to measure the soundness of the cement?
Option A:	Vicat Apparatus
Option B:	Le-Chatelier apparatus
Option C:	Soundness meter
Option D:	Duff Abrams apparatus
4.	What is the initial setting time?
Option A:	The time at which cement paste loses its elasticity
Option B:	The time at which cement paste loses its plasticity
Option C:	The time at which cement paste gains its plasticity
Option D:	The time at which cement paste gains its elasticity
5.	Which compound is liberates lower heat?
Option A:	C2S
Option B:	C3S
Option C:	C3A
Option D:	C4AF
6.	Diameter of Round Steel Fiber lies in the range of
Option A:	0.3mm-0.5mm
Option B:	0.25mm -0.75mm
Option C:	0.155mm - 0.41mm
Option D:	0.25mm - 0.90mm

7.	Aerated Concrete is a type of one of the following concrete
Option A:	Very heavy weight
Option B:	Heavy weight
Option C:	Medium weight
Option D:	Light weight
8.	What is the Specific gravity of Light Weight concrete
Option A:	<2.4
Option B:	2.4-2.8
Option C:	>2.8
Option D:	>3
9.	Which of the following compressive strength for concrete is required from structural consideration?
Option A:	Nominal
Option B:	Minimum
Option C:	Maximum
Option D:	Approximate
10.	For the given slump and maximum size of coarse aggregate, which of the following quantity can be determined?
Option A:	Slump value
Option B:	The maximum size of aggregate
Option C:	The amount of mixing water
Option D:	The minimum water-cement ratio
11.	In ACI Method, Maximum size of aggregates should not be larger than
Option A:	1/5 the minimum dimension of structural members
Option B:	1/4 the minimum dimension of structural members
Option C:	1/3 the minimum dimension of structural members
Option D:	1/6 the minimum dimension of structural members
12.	Which cement is used for mainly building construction where strength required with age?
Option A:	Rapid Hardening Cement
Option B:	Low Heat Cement
Option C:	Portland Pozzolana Cement
Option D:	Quick Setting Cement
13.	With the increase in aspect ratio of fibre reinforced concrete
Option A:	Relative strength increases
Option B:	Relative strength decreases
Option C:	Relative strength increases and then decreases
Option D:	Relative strength decreases and then increases
14.	In Fibre Reinforced concrete, which of the following fibre have high tensile strength value?
Option A:	Steel fibre
Option B:	Nylon fibre
Option C:	Polypropylene fibre

Option D:	Glass fibre
15.	Which of the following fibres have very high impact strength?
Option A:	Carbon fibre
Option B:	Steel fibre
Option C:	Coir fibre
Option D:	Nylon fibre
16.	For fibre reinforced concrete, the toughness is increases to _____ times as compared to plain concrete
Option A:	5 to 10
Option B:	10 to 20
Option C:	10 to 40
Option D:	30 to 50
17.	The most effective orientation of fibres on Fibre reinforced concrete is
Option A:	Parallel to the direction of load
Option B:	Perpendicular to the direction of load
Option C:	Randomly spread
Option D:	45° to the load
18.	An ultrasonic pulse velocity test is an
Option A:	Ex-situ, nondestructive test
Option B:	In-situ, nondestructive test
Option C:	Ex-situ, destructive test
Option D:	In-situ, destructive test
19.	Which of the following methods of inspection uses high frequency of sound waves for the detection of flaws in the castings?
Option A:	Penetrant test
Option B:	Radiography
Option C:	Pressure test
Option D:	Ultrasonic inspection
20.	Strength of concrete increase with
Option A:	Increase with w/c ratio
Option B:	Decrease with w/c ratio
Option C:	Decrease in size of aggregates
Option D:	Decrease in curing time

<b>Q2</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	State the physical and mechanical properties of steel fibers in concrete.	
B	List the various types of cement indicating their use for different applications.	
C	What do you understand by destructive, non-destructive and partial destructive tests on concrete? Give an example in each test.	

D	Define hot weather concreting. What are the effects of hot weather on concrete?
E	What do you understand by Rapid hardening cement? Why that is rapid rate of strength gain?
F	What are the factors to get good concrete performance in aggressive environment?

<b>Q3</b>	
<b>A</b>	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	Define High performance concrete. Give its constituents. What are the various parameters considered in the production of H.P.C?
ii.	Explain Alkali Carbonate reaction in concrete in detail.
iii.	Write a short note on Durability of concrete
<b>B</b>	<b>Solve any One</b> <span style="float: right;"><b>10 marks each</b></span>
i.	Design a concrete mix by IS 10262: 2009 for the following data: i. Characteristic compressive strength required in the field at 28 days grade designation = M 25 ii. Standard Deviation = 4.0 iii. Nominal maximum size of aggregate = 20 mm iv. Shape of C.A aggregate = Angular v. Degree of workability required at site = 50-75 mm slump vi. Type of exposure = mild vii. Method of concrete placing = Pumpable concrete viii. Specific gravity of cement = 3.15 ix. Specific gravity of C.A = 2.84 x. Specific gravity of F.A = 2.64 xi. Aggregates are assumed to be in saturated surface dry condition. xii. F.A belongs to Zone II
ii.	Design a concrete mix by ACI method for the following data: i. Characteristic compressive strength required in the field at 28 days grade designation = M 20 ii. Standard Deviation = 4.0 iii. Nominal maximum size of aggregate = 20 mm iv. Type of cement = Type 1 v. Shape of C.A aggregate = Crushed Angular vi. Degree of workability required at site = 100 mm slump vii. Type of exposure = mild viii. Dry rodded density of coarse aggregate = 1640 kg/mm <sup>3</sup> ix. Specific gravity of cement = 3.15 x. Specific gravity of C.A = 2.78 xi. Specific gravity of F.A = 2.72 xii. Degree of supervision = Good xiii. Maximum water cement ratio = 0.50 xiv. Fineness modulus = 2.8 xv. Aggregates are assumed to be in saturated surface dry condition.

**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

NOTE — These quantities of mixing water are for use in computing cementitious material contents for trial batches.

<sup>1)</sup> Water content corresponding to saturated surface dry aggregate.

**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

<sup>1)</sup> Volumes are based on aggregates in saturated surface dry condition.

**Table 5 Minimum Cement Content, Maximum Water-Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20 mm Nominal Maximum Size**  
(Clauses 6.1.2, 8.2.4.1 and 9.1.2)

Sl No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m <sup>3</sup>	Maximum Free Water-Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg/m <sup>3</sup>	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

NOTES

1 Cement content prescribed in this table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2. The additions such as fly ash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and water-cement ratio if the suitability is established and as long as the maximum amounts taken into account do not exceed the limit of pozzolona and slag specified in IS 1489 (Part 1) and IS 455 respectively.

2 Minimum grade for plain concrete under mild exposure condition is not specified.

Slump (mm)

1. Non-air-entrained concrete  
Stiff-plastic  
Plastic (70-90)  
Flowing  
Approximately 100 mm  
Entrapped air
2. Air-entrained concrete  
Stiff-plastic  
Plastic (70-90)  
Flowing  
Approximately 100 mm  
Entrapped air
3. Recommended slump for different exposure conditions  
Mild exposure  
Moderate exposure  
Severe exposure

28-day compressive strength <sup>#</sup> (N/mm <sup>2</sup> )	Water/cementing material ratio by mass*	
	Non-air-entrained concrete	Air-entrained concrete
45	0.38	0.30
40	0.42	0.34
35	0.47	0.39
30	0.54	0.45
25	0.61	0.52
20	0.69	0.60
15	0.97	0.70

<i>Nominal maximum size of coarse aggregate (mm)</i>	<i>Bulk volume of oven-dry-rodded coarse aggregate (m<sup>3</sup>) fineness modulus of fine aggregate</i>			
	<i>2.40</i>	<i>2.60</i>	<i>2.80</i>	<i>3.00</i>
10	0.50	0.48	0.46	0.44
14	0.59	0.57	0.55	0.53
20	0.66	0.64	0.62	0.60
28	0.71	0.69	0.67	0.65
40	0.75	0.73	0.71	0.69
56	0.78	0.76	0.74	0.72
80	0.82	0.80	0.78	0.76
150	0.87	0.85	0.83	0.81