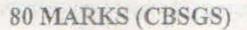
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INSTRUCTIONS: 1. Question number 1 is COMPULSORY. 2. Attempt any THREE from the remaining. 3. Each full question carries EQUAL marks. 4) ASSUME any suitable data, if needed.

1. a) Carry out the Concrete Mix Design for M30 grade of concrete as per Indian Standard method. The target strength to be achieved is 38.25 MPa. The water-cement ratio for the required target strength is 0.49 (from the graph). Refer the various tables given at the end. The details are as below.

Design Parameters		Material Properties		
Max. size of coarse aggregates	20 mm.	Cement	53 grade (IS: 12269-1987)	
Shape of coarse aggregates	Angular	Sp. gravity of cement	3.15	
Degree of workability (compacting factor)	0.85	Coarse Aggregates	20 iom & 12.5 mm in the (60:40) ratio	
Degree of quality control	Fair	Sand	Conforming to Zone II	
Degree of exposure	Severe	Sp. gravity of CA	2.67	
		Sp. gravity of sand	2.60	

b) Enlist the types of cement. Discuss Rapid Harden	ning Cement.	(05 M)
c) Write a note on permeability of concrete.		(05 M)
2. a) Explain the hydration of cement.		(05 M)
b) Write a note on Rebound Hammer Test on cond	crete.	(05 M)
c) Explain routing & sealing method of crack repair	techniques, with neat sketch.	(05 M)
d) What are the properties of High Strength Concre	te?	(05 M)
3. Write notes on the following.		(20 M)
a) Ready Mixed Concrete b)	Curing of Concrete	
c) Segregation d)	Slump test	

- 4. a) Why bleeding takes place in concrete? What are the factors affecting bleeding? If the rate of bleeding is less than that of surface evaporation, what happens to the concrete? (05 M)
- b) Discuss the factors affecting creep & shrinkage of concrete. (05 M)
- c) For major concreting works, you would recommend weigh batching or volume batching? Discuss with substantial reasoning.

 (05 M)

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d) What is the effect of m	aximum size of aggrega	te on concrete strength?	(05 M)
5. a) Choose & write the			(4 X 1= 04 M)
i) The most com a) Gypsum	monly used admixture v b) Calcium chloride	which prolongs the setting c) Sodium silicate	g & hardening time is d) All of the above
ii) If 380 ml (or grams) consistency, the percentage	of water is required to	to have a cement paste	of 1880 grams of normal
a) 26.67%	b) 20.21%	c) 25.33%	d) None of these
iii) Wp and Wf are the concrete. If the compaction	weights of a cylinder con factor (Wp/Wf) is 0.9	ontaining partially com 5, the workability of con	pacted and fully compacted crete is:
a) Extremely low	b) Very low	c) Low	d) High
iv) The target mean str deviation = 4, is:	ength (MPa) for M25	grade concrete with ris	k factor = 1.65 & standard
a) 18.4	b) 45.25	c) 31.6	d) none of these
b) Write a detailed a	note on High Performance	ce Concrete.	(08 M)
c) Write a detailed i	note on Light Weight Co	ncrete.	(08 M)
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6. Write notes on the following.

(20 M)

a) Retarders in concrete

b) Self Compacting Concrete

c) Creep of concrete

d) Shrinkage of concrete

Data for Concrete Mix Design from Indian Standard Code [Q. 1 (a)]

Table 1: Minimum cement content, maximum water-cement ratio & minimum concrete grade (20 mm nominal max. size of aggregates)

ENDARING	Reinforced Concrete			
Exposure	Min. cement content (kg/m³)	Max. free water-cement ratio	Min. concrete grade	
2.01.2	3'00	0.55	M20	
Mila	300	0.50	M25	
Moderate		0.45	M30	
Severe	320	0.45	M35	
Very Severe	340		M40	
Extreme	360	0.40	441.10	

Maximum cement content: restricted to 450 kg/m³.

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Table 2: Approximate sand & water content per m3 of concrete*

Grade	Nominal size of aggregate (mm)	Water content in m3 of concrete (kg)	Sand as % of aggregate by absolute volume	Remarks
Up to	10	208	40	-
M35	20	186	40	Sand zone II,
	40		35	water-cement
Beyond	10	163	30	ratio = 0.6
M35	20	200	28	Compaction
-	apply to the conditions of	180	25	Factor = 0.8

^{*} These values apply to the conditions given in the remarks column. For other conditions corrections are to be applied as per Table 3.

Table 3: Corrections to the values given in <u>Table 2</u>, to be applied for conditions other than those given in the remarks column of <u>Table 2</u>.

Change in conditions other than those given in Table 2	Correction for water content	Correction for sand content in total aggregates (%)
Sand conforming to zone I, III or IV	0	+1.5 for zone I, -1.5 for zone III,
Increase or decrease in compacting factor value by 0.1 (for workability)	+3%	- 3.0 for zone IV
Each 0.05 increase or decrease in water-	0	<u>+</u> 1%
For rounded aggregates (gravel)	-15 kg/m^3	- 7%

Table 4: Approximate Air Content

Maximum size of aggregate (mm)	Entrapped air
10	30/2
20	2%
40	1%