S - 2605

Seat No.	

Total No. of Pages : 4

S.E. (Civil Engineering) (Part - II) (Semester - IV) Examination, December - 2015
CONCRETE TECHNOLOGY
Sub. Code : 45539

Day and Date : Saturday, 19 -12 - 2015.
Time : 02.30 p.m. to 05.30 p.m. **Total Marks : 100**

Instructions : 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable data if necessary.

SECTION - I

Q1) a) Explain the various tests for physical properties of cement. [8]
b) What do you mean by gap graded aggregate? Explain its important feature. [8]

Q2) a) Define curing and describe the different method of curing. [8]
b) Explain measurement of workability of concrete using. [8]
i) Compaction factor method
ii) Vee- bee consistometer method

OR

What are defferent types of admixture used in concrete? Explain in detail effect of super-plasticizer on concrete? [8]

Q3) a) Explain the relation between the strength and water-cement ratio of concrete. [9]
b) Explain factors affecting the modulus of elasticity of concrete. [9]

SECTION - II

Q4) Write short notes (any three). [18]
a) No-fines Concrete
b) Shotcreting
c) Fibre Reinforced Concrete
d) Cold Weather Concreting

Q5) a) Explain effect of w/c ratio on durability and permeability of concrete. [8]
b) What do you understand by carbonation of concrete? How is it tested? [8]

OR

Explain use of cover meter and corrosion meter. [8]

P.T.O.

Q6) Design M 25 grade of concrete using the following data as per ACI 211 - 91 method: **[16]**

Grade of cement: 43 Grade OPC
Degree of quality control: Good
Maximum size of aggregate: 20 mm
Slump required: 75 mm
Fineness modulus of coarse aggregate: 6.2
Fineness modulus of fine aggregate: 3.2
Specific gravity of Coarse aggregate: 2.90; Fine aggregate: 2.78
Density of coarse aggregate: 1550 kg/m^3
Density of fine aggregate: 1500 kg/m^3
Sand: Zone I
Assume any other data suitably.

Table 11.4 Dry Bulk volume of Coarse Aggregate Per Unit Volume of Concrete as given by ACI 211.1 - 91

Maximum Size of Aggregate	*Bulk volume of dry rodded coarse aggregate Per unit volume of concrete for fineness Modulus of sand of*			
F.M	2.40	2.60	2.80	3.00
10	0.50	0.48	0.46	0.44
12.5	0.59	0.57	0.55	0.53
20	0.66	0.64	0.62	0.60
25	0.71	0.69	0.67	0.65
40	0.75	0.73	0.71	0.69
50	0.78	0.76	0.74	0.72
70	0.82	0.80	0.78	0.76
150	0.87	0.85	0.83	0.81

Table 11.5 Relation between water/cement ratio and average compressive strength of concrete, according to ACI 211.1-91.

Average compressive Strength at 28 days	*Effective water/cement ratio (by mass)*	
MPa	*Non-air entrained concrete*	*Air-entrained concrete*
45	0.38	-
40	0.43	-
35	0.48	0.40
30	0.55	0.46
25	0.62	0.53
20	0.70	0.61
15	0.80	0.71

Table 11.B. Approximate requlrements for mixing water and air content for different work abilities and nominal maximum size of Aggregates according to ACI 211.1-91

Workability or Air content	*Water content Kg/m² of concrete for indicated maximum aggregate size*							
	10mm	12.5mm	20mm	25mm	40mm	50mm	70mm	150mm
	Non-air entrained concrete							
Slump								
30-50mm	205	200	185	180	160	155	145	125
80-100mm	225	215	200	195	175	170	160	140
150-180mm	240	230	210	205	185	180	170	-
Approximate entrapped air content per cent	3	2.5	2	1.5	1	0.5	0.3	0.2
	Air-entrained Concrete							
Slump								
30-50mm	180	175	165	160	145	140	135	120
80-100mm	200	190	180	175	160	155	150	135
150-180mm	215	205	190	185	170	165	160	-
Recommended average total air content percent								
Mlc exposure	4.5	4.0	3.5	3.0	2.5	2.0	1.5	1.0
Moderate exposure	6.0	5.5	5.0	4.5	4.5	4.0	3.5	3.0
Extreme exposure	7.5	7.0	5.0	6.0	5.5	5.0	4.5	4.0

Table 11.6. Requirements of ACI 318-89 for W/C ratio and Strength for Special Exposure Conditions

	Exposure condition	*Maximum W/C ratio, normal density aggregate concrete*	*Minimum design strength, low density aggregate concrete MPa*
I	Concrete Intended to Watertight		
	(a) Exposed to fresh water	0.5	25
	(b) exposed to brackish or sea water	0.45	30
II	Concrete exposed to freezing and thawing in a moist condition:		
	(a) kerbs, gutters. gaurd rails or thin sections	0.45	30
	(b) other elements	0.50	25
	(c) in presense of de-icing chemicals	0.45	30
III	For corrosion protection of reinforced concrete exposed to de-icing salts, brackish water, sea water or spray from these sources	0.40	33

Placing and Mixing condition	Degree of control	Standard Deviation MPa
Dried aggregates, completely accurate grading exact water/cement ratio, controlled temperature curing.	Laboratory Precision	1.3
Weigh-batching of all materials, control of aggregate grading. 3 sizes of aggregate plus sand control of water added to allow for moisture content of aggregates, allowance for weight of aggregate & sand displaced by water, continual supervision	Excellent	2.8
Weigh-batching of all materials, strict control of aggregate grading, control of water added to allow for moisture content of aggregates, continual supervision	High	3.5
Weigh-batching of all materials, control of aggregate grading, control of water added, frequent supervision	Very good	4.2
Weighing of all materials, water content controlled by inspection of mix, periodic check of workability, use of two sizes of aggregate (fine&coarse) only, intermittent supervision.	Good	5.7
Volume batching of all aggregates allowing for bulking of sand, weigh batching of cement, water content controlled by inspection of mix, intermittent supervision.	Fair	6.5
Volume batching of all materials, use of all in aggregate, little or no supervision.	Poor Uncontrolled	7.0 8.5

Table 11.9 First estimate of density (unit weight) of fresh concrete as given by ACI 211.1-91.

Maximum size of aggregate mm	*First estimate of density (unit weight) of fresh concrete*	
	Non-air-entrained kg/m³	*Air-entrained kg/m³*
10	2285	2190
12.5	2315	2235
20	2355	2280
25	2375	2315
40	2420	2355
50	2445	2375
70	2465	2400
150	2505	2435

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