

GANPAT UNIVERSITY

B. Tech. Semester: IV (CIVIL), Regular Examination / April - June 2015

2CI406 - CONCRETE TECHNOLOGY

Total Marks: 70

Time: 3 Hours

Instruction: 1 Answer to the two sections must be written in separate answer books:

2 Assume suitable data if required.

3 Figures to the right indicate full marks

Section - I

- 1 Design a concrete mix (as per IS: 10262-2009) for a reinforced concrete work which will be exposed to the Extreme condition. The concrete mix is to be designed as below data. (12)

(a). Stipulations for proportioning : (1) Grade of designation: M 30, (2) Types of cement : PPC, (3) Maximum nominal size of aggregate : 10 mm ,(4) Workability in terms of Slump: 100 mm, (5) Method of concrete placing: Pumping, (6) Degree of supervision : Good, (7) Type of aggregate: Crushed angular aggregate and (8) Chemical admixture type: Superplasticiser (Use 1.5% of total cementitious material content) (9) Types of mineral admixture : Silica fume (Use 12% of total cementitious material content)

(b) Test data of materials (As per IS) : (1) Specific gravity of: Coarse aggregate: 2.70, Fine aggregate: 2.67, Cement: 3.15 and Chemical admixture: 1.145, Silica fume : 2.75 (2) Water absorption (IS 2386:1963) : (I) Coarse aggregate: 0.5% and (II) Fine aggregate: 1 %, (3) Free (surface) moisture: (I) Coarse aggregate: Nil (absorbed moisture also nil) (II) Fine aggregate: nil and (4) Sieve analysis (IS 2386 Part 1): (I) Coarse aggregate: (Conforming to Table 2 of IS 383) and (II) Fine aggregate: Conforming to grading Zone III

- 2 (A) List out the advantages and disadvantages of concrete (04)
- (B) Write a short note: (1) Slip form technique. (04)
(2) Underwater concreting by Tremie Method
- (C) Define workability and explain compaction factor test. (04)

OR

- 2 (A) Write a short note: Trace the historical development of concrete technology. (04)
- (B) Explain method of transportation of concrete. (04)
- (C) Enlist the causes of segregation. How to minimize the risk of segregation? (04)

- 3 (A) What are the advantages of using high strength of concrete? (03)
(B) State causes and precautions for distress in structures. (04)
(C) What is RMC? What are its advantages? (04)

OR

- 3 (A) Write Short note on : (09)
(a) High Performance Concrete (b) Geopolymer Concrete (C) Shotcrete
(B) Give the name of Repairs & Rehabilitation Techniques (02)

Section - II

- 4 (A) Define durability of concrete and explain factor affecting it. (04)
(B) Note down a various types and causes of cracks in concrete. (04)
(C) Write a short note on : Sulphate Attack (03)
5 Write a short note on : (12)
(I) Gap Grading, (II) Aggregate Crushing Value Test , (III) Adverse effect of excessive use of admixtures and (IV) Differentiate between C.A. and F.A.

OR

- 5 (A) Explain Laboratory Procedure to find flakiness and elongation index of aggregates. (06)
(B) Enlist the classification of aggregate and explain in detail any two type classification of aggregate. (06)
6 (A) Discuss the purposes of testing hardened concrete (04)
(B) State factors affecting compressive strength of concrete and explain any one. (04,
(C) Enlist and explain manufacture of Portland Cement. (04)

OR

- 6 (A) Describe the Bogue's Chemical compounds composition of Portland cement. (05)
(B) Explain Non – destructive testing (NDT) and its different methods and explain any one. (07)

END OF PAPER

Table 1 Assume Standard Derivation (IS 10262 :2009, Clauses 3.2.1.2, A-3 and B-3,Page-2)

Sr.No.	Grade of Concrete	Assume Standard Derivation N /mm ²
1	M 10	3.5
2	M 15	
3	M 20	4.0
4	M 25	
5	M 30	5.0
6	M 35	
7	M 40	
8	M 45	
9	M 50	
10	M 55	

Note: The above values correspond to site control having proper storage of cement; weigh batching of all materials; controlled addition of water; regular checking of all materials, aggregate grading and moisture content; and periodical checking of workability and strength. Where there is deviation from the above, values given in the above table shall be increased by 1 N/mm²

Table 2 Maximum Water Content per Cubic Metre of Concrete for Nominal Maximum Size of Aggregate (IS 10262 :2009, Clauses 4.2,A-5 and B-5, Page-3)

Sr.No.	Nominal Maximum size of aggregate (mm)	Maximum Water Content # kg
1	10	208
2	20	186
3	40	165

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

#Water content corresponding to saturated surface dry aggregate

Sr.No.	Nominal Maximum size of aggregate (mm)	Volume of coarse aggregate [#] per unit volume of total aggregate for different zones of fine Aggregate (For water-cement ratio = 0.5)			
		Zone IV	Zone III	Zone II	Zone I
1	10	0.50	0.48	0.46	0.44
2	20	0.66	0.64	0.62	0.6
3	40	0.75	0.73	0.71	0.69

#Volumes are based on aggregates in saturated surface dry condition.

Sr. No	Exposure	Plain Concrete			Reinforcement Concrete		
		Minimum Cement Content kg /m ³	Maximum Free Water - Cement Ratio	Minimum Grade of Concrete	Minimum Cement Content kg /m ³	Maximum Free Water - Cement Ratio	Minimum Grade of Concrete
i	Mild	220	0.60	--	300	0.55	M 20
ii	Moderate	240	0.60	M 15	300	0.50	M 25
iii	Servere	250	0.50	M 20	320	0.45	M 30
iv	Very Servere	260	0.45	M 20	340	0.45	M 35
v	Extreme	280	0.40	M 25	360	0.40	M 40

Note :

- 1.Cement content prescribed in the above table is irrespective of the grades of cement and it is inclusive of additions mentioned in 5.2.The additions such as flyash or ground granulated blast furnace slag may be taken into account in the concrete composition with respect to the cement content and w/c ratio if suitability established and as long as the maximum amounts taken into account do not exceed the limit of pozzolana and slag specified in IS 1489(partt) and IS 455 respectively
2. Minimum grade for plain concret under mild exposure condition is not spcified.