

CONCRETE TECHNOLOGY
PART-I

Time: Three Hours

Full Marks 100
(50 marks for 1st part)

Use a separate Answer-Script for each part

[No code or handbook is allowed, assume any suitable data]

No. of questions		Marks (50)
1.	Design a mix proportion of following concrete (15) a) Grade designation- M40 b) Type of cement -OPC 43 grade conforming to IS.8112 c) Type of mineral admixture -Fly ash conforming to IS 3812 (Part I) d) Maximum nominal size of aggregate -20mm e) Minimum cement content -320 kg/m' f) Maximum water-cement ratio -0.45 g) Workability-75 mm (slump) h) Exposure condition -mild (for reinforced concrete) j) Method of concrete placing- Pumping k) Degree of supervision -Good m) Type of aggregate -Crushed angular aggregate n) Maximum cement (OPC) content-450 kg/m' p) Chemical admixture type- Superplasticizer TEST DATA FOR MATERIALS a) Cement used- OPC 43 grade conforming to IS 8112 b) Specific gravity of cement- 3.15 c) Fly ash Conforming to- IS 3812 (Part I) d) Specific gravity of fly ash - 2.2 e) Chemical admixture- Superplasticizer conforming to IS 9103 f) Specific gravity of: 1) Coarse aggregate-2.74 2) Fine aggregate-2.74 g) Water absorption: 1) Coarse aggregate-0.5% 2) Fine aggregate-1% h) Free (surface) moisture:	15

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1) Coarse aggregate-Nil 2) Fine aggregate- Nil																																			
g) Sieve analysis:																																			
<table border="1"> <caption>Table 1 Value of X (Clause 4.2)</caption> <thead> <tr> <th>Sl No. (1)</th> <th>Grade of Concrete (2)</th> <th>Value of X (3)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">i)</td> <td>M10</td> <td rowspan="2">5.0</td> </tr> <tr> <td>M15</td> </tr> <tr> <td rowspan="2">ii)</td> <td>M20</td> <td rowspan="2">5.5</td> </tr> <tr> <td>M25</td> </tr> <tr> <td rowspan="6">iii)</td> <td>M30</td> <td rowspan="6">6.5</td> </tr> <tr> <td>M35</td> </tr> <tr> <td>M40</td> </tr> <tr> <td>M45</td> </tr> <tr> <td>M50</td> </tr> <tr> <td>M55</td> </tr> <tr> <td>iv)</td> <td>M65 and above</td> <td>8.0</td> </tr> </tbody> </table>	Sl No. (1)	Grade of Concrete (2)	Value of X (3)	i)	M10	5.0	M15	ii)	M20	5.5	M25	iii)	M30	6.5	M35	M40	M45	M50	M55	iv)	M65 and above	8.0	<table border="1"> <caption>Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate (Clause 5.3)</caption> <thead> <tr> <th>Sl No. (1)</th> <th>Nominal Maximum Size of Aggregate mm (2)</th> <th>Water Content¹⁾ kg (3)</th> </tr> </thead> <tbody> <tr> <td>i)</td> <td>10</td> <td>208</td> </tr> <tr> <td>ii)</td> <td>20</td> <td>186</td> </tr> <tr> <td>iii)</td> <td>40</td> <td>165</td> </tr> </tbody> </table>	Sl No. (1)	Nominal Maximum Size of Aggregate mm (2)	Water Content ¹⁾ kg (3)	i)	10	208	ii)	20	186	iii)	40	165
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	<p>¹⁾Water content corresponding to saturated surface dry aggregate.</p>																																		

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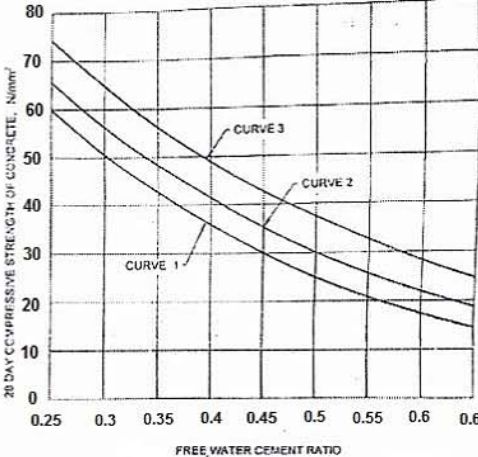
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No. of questions		Marks (50)
	Find the percentage of C3S, C2S, C3A and C4AF. What is lime saturation factor of this cement? On the basis of the result comment on this cement.	
3)	Write down the chemical reactions takes place while adding water into cement.	5
a)		
b)	Briefly describe the dry process of manufacturing of cement.	5
4)	Answer any three of the followings a) Fiber reinforced concrete b) Superplasticiser c) Shotcrete d) Air entraining admixture e) Ready Mix concrete	5X3 = 15

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	<p style="text-align: center;">Table 3 Approximate Air Content (Clause 5.2)</p> <table border="1" data-bbox="225 757 703 927"> <thead> <tr> <th>Sl No.</th> <th>Nominal Maximum Size of Aggregate mm</th> <th>Entrapped Air, as Percentage of Volume of Concrete</th> </tr> <tr> <th>(1)</th> <th>(2)</th> <th>(3)</th> </tr> </thead> <tbody> <tr> <td>i)</td> <td>10</td> <td>1.5</td> </tr> <tr> <td>ii)</td> <td>20</td> <td>1.0</td> </tr> <tr> <td>iii)</td> <td>40</td> <td>0.8</td> </tr> </tbody> </table> <div style="text-align: center;">  </div> <p style="text-align: center;">Table 5 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate for Water-Cement/Water-Cementitious Materials Ratio of 0.50 (Clause 5.5)</p> <table border="1" data-bbox="304 1323 1246 1532"> <thead> <tr> <th rowspan="2">Sl No.</th> <th rowspan="2">Nominal Maximum Size of Aggregate mm</th> <th colspan="4">Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate</th> </tr> <tr> <th>Zone IV</th> <th>Zone III</th> <th>Zone II</th> <th>Zone I</th> </tr> <tr> <th>(1)</th> <th>(2)</th> <th>(3)</th> <th>(4)</th> <th>(5)</th> <th>(6)</th> </tr> </thead> <tbody> <tr> <td>i)</td> <td>10</td> <td>0.54</td> <td>0.52</td> <td>0.50</td> <td>0.48</td> </tr> <tr> <td>ii)</td> <td>20</td> <td>0.66</td> <td>0.64</td> <td>0.62</td> <td>0.60</td> </tr> <tr> <td>iii)</td> <td>40</td> <td>0.73</td> <td>0.72</td> <td>0.71</td> <td>0.69</td> </tr> </tbody> </table> <p>NOTES</p> <ol style="list-style-type: none"> 1 Volumes are based on aggregates in saturated surface dry condition. 2 These volumes are for crushed (angular) aggregate and suitable adjustments may be made for other shape of aggregate. 3 Suitable adjustments may also be made for fine aggregate from other than natural sources, normally, crushed sand or mixed sand may need lesser fine aggregate content. In that case, the coarse aggregate volume shall be suitably increased. 4 It is recommended that fine aggregate conforming to Grading Zone IV, as per IS 383 shall not be used in reinforced concrete unless tests have been made to ascertain the suitability of proposed mix proportions. 	Sl No.	Nominal Maximum Size of Aggregate mm	Entrapped Air, as Percentage of Volume of Concrete	(1)	(2)	(3)	i)	10	1.5	ii)	20	1.0	iii)	40	0.8	Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate 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	0.54	0.52	0.50	0.48	ii)	20	0.66	0.64	0.62	0.60	iii)	40	0.73	0.72	0.71	0.69	
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2)	The oxide composition of OPC is as follows: CaO (60%), SiO ₂ (15%), Al ₂ O ₃ (5%), Fe ₂ O ₃ (2%), SO ₃ (1%)	10																																																	

BACHELOR OF ENGINEERING (CIVIL ENGINEERING)**FOURTH YEAR 2nd SEM. EXAM. 2022****Subject: CONCRETE TECHNOLOGY. PART-II TIME: 3 Hours Full Marks: 100**

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No. of questions	Part II (Answer all questions)	Marks (10X5=50)
1. (a) (b)	Write Short note Bleeding and segregation Carbonation of concrete.	5X2 =10
2.	What do you mean by flexural strength of concrete? Describe the procedure of measuring the flexural strength of concrete in the laboratory.	2+8=10
3.	What do you mean by workability of concrete? Describe the factors affecting the workability of concrete.	2+ 8=10
4.	What do you mean by shrinkage and creep of concrete? Describe different type of shrinkage occurred in concrete.	4+6=10
5.	What are the properties of self-compacting concrete? Describe J-ring test for measuring the workability of self-compacting concrete.	3+7=10