Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Building Materials and Concrete Technology **Semester: III**

Program: B. Tech. Civil Engineering **Time: 03 hrs.**

Course Code: CIVL2036 **Max. Marks: 100**

Instructions: Assume suitable values for any missing data

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	Write the advantages and disadvantages of steel as a construction material.	**4**	**CO2**
Q2	What is a truss? What type of forces are the truss members subjected to? What is the minimum number of members required to make a stable truss with 7 joints?	**4**	**CO2**
Q3	Discuss dots and screeds in plastering with the help of neat sketches.	**4**	**CO2**
Q4	Explain the concept of sustainable construction and its significance.	**4**	**CO3**
Q5	What is workability and how is it measured? Briefly discuss the effect of recycled concrete aggregates on the workability.	**4**	**CO3**
	SECTION B **(4Qx10M= 40 Marks)**		
Q6	Discuss in detail the importance of painting, constituents of paint and various defects in paint. **OR** Discuss the advantages and disadvantages of bolted connections in structural design. With the help of sketches, explain different types of bolted connections commonly used in construction.	**10**	**CO2**
Q7	Explain Construction and Demolition Waste (CDW) and discuss the importance of recycling it. Additionally, analyze the environmental impacts of a concrete structure from its cradle to grave.	**10**	**CO3**
Q8	Discuss why it is required to produce geopolymer concrete and how this can be done. Additionally, provide a list of factors that might affect the properties of geopolymer concrete.	**10**	**CO3**
Q9	Describe the concept of green building and provide a brief overview of the various green building rating systems.	**10**	**CO4**
	SECTION-C **(2Qx20M=40 Marks)**		

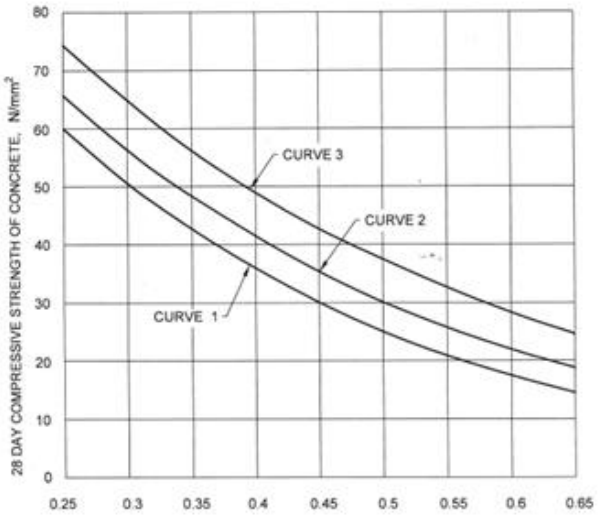
<table>
<tr><td>Q10</td><td>Describe how the construction industry contributes to various sustainability issues. Also, discuss the key principles of sustainable construction and the factors that influence the choice of construction materials to promote sustainability.

OR

Describe recycled aggregate concrete and how it differs from conventional concrete. Discuss the various factors that affect the fresh and hardened properties of recycled aggregate concrete. Additionally, explain the different methods to improve the properties of recycled aggregate concrete.</td><td>20</td><td>CO4</td></tr>
<tr><td>Q11</td><td>Provide mix proportioning for concrete of grade M25 based on the following data: Factor, X = 6.5; Standard deviation = 5; Types of cement: OPC43; Maximum size of coarse aggregate: 20 mm; Exposure condition: Severe (Reinforced concrete); Workability: 120 mm (slump); Specific gravity of cement: 3.15; Specific gravity of fine and coarse aggregate are 2.70 and 2.75 respectively; Water absorption of coarse ad fine aggregates are 0.5 and 0.7% percent respectively; Fine aggregates conform to Zone III as per IS 383: 2016; Specific gravity of superplasticizer: 1.10. The following figures and table may be used, if necessary. What changes in the concrete mix proportioning would you suggest if 75% of the natural coarse aggregates were replaced by recycled coarse aggregates (specific gravity = 2.40) by both volume and by weight?

Table 3 Approximate Air Content
(Clause 5.2)
<table><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><td>(1)</td><td>(2)</td><td>(3)</td></tr><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></table>
Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate
(Clause 5.3)
<table><tr><th>Sl No.</th><th>Nominal Maximum Size of Aggregate
mm</th><th>Water Content[1)]
kg</th></tr><tr><td>(1)</td><td>(2)</td><td>(3)</td></tr><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></table>[1)]Water content corresponding to saturated surface dry aggregate.

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)
<table><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><td>(1)</td><td>(2)</td><td>(3)</td><td>(4)</td><td>(5)</td><td>(6)</td></tr><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></table></td><td>20</td><td>CO3</td></tr>
</table>



Curve 1 : for expected 28 days compressive strength of 33 and < 43 N/mm².
Curve 2 : for expected 28 days compressive strength of 43 and < 53 N/mm².
Curve 3 : for expected 28 days compressive strength of 53 N/mm² and above.

NOTES

1 In the absence of data on actual 28 days compressive strength of cement, the curves 1, 2 and 3 may be used for OPC 33, OPC 43 and OPC 53, respectively.

2 While using PPC/PSC, the appropriate curve as per the actual strength may be utilized. In the absence of the actual 28 days compressive strength data, curve 2 may be utilized.