Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Building Materials and Sustainable Construction **Semester: V**

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

Course Code: SUEN3001 **Max. Marks: 100**

Instructions: Assume suitable values for any missing data

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	Discuss types of bolted connections commonly used in steel construction.	**4**	**CO2**
Q2	What is pointing and why is it used? List various types of pointing.	**4**	**CO2**
Q3	Explain the operations involved in painting plastered surfaces.	**4**	**CO2**
Q4	Explain the morphological difference between recycled concrete aggregate and natural coarse aggregate.	**4**	**CO3**
Q5	Describe low carbon cement and its importance.	**4**	**CO4**
SECTION B **(4Qx10M= 40 Marks)**			
Q6	Describe how the construction industry can address the challenge of reducing construction waste and promote recycling and reuse of materials?	**10**	**CO4**
Q7	At a given water-cement ratio, either a change in the cement content or aggregate grading can be made to increase the consistency of a concrete mixture. Which one of the two options would you recommend and why? Why is it not desirable to produce concrete mixtures of a higher consistency than necessary? **OR** (a) Explain how water-cement ratio influences the strength of the cement paste matrix and the interfacial transition zone in concrete. (b) What do you understand by the curing of concrete and what is its significance?	**10** **OR** **5+5**	**CO2**

Q8	Evaluate the sustainability benefits of using recycled aggregates in concrete construction. Also, discuss the factors affecting the workability of recycled aggregate concrete and how these issues can be mitigated.	**10**	**CO3**
Q9	Explain geopolymer concrete and discuss the key difference between conventional concrete and geopolymer concrete. Also, examine the effect of curing condition on the compressive strength of geopolymer concrete.	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q10	Discuss in detail how the use of recycled concrete aggregates affects the strength and durability of concrete. Discuss the factors influencing the performance of recycled aggregate concrete. **OR** Discuss the importance of Interfacial Transition Zone (ITZ) in concrete and how the ITZ in recycled aggregate concrete differs from conventional concrete. Also, discuss in detail various techniques available to improve the qualities of recycled aggregates and recycled aggregate concrete.	**20**	**CO4**
Q11	Provide mix proportioning for concrete of grade M35 based on the following data: Factor, X = 6; Standard deviation = 4; Types of cement: OPC43; Maximum size of coarse aggregate: 20 mm; Exposure condition: Severe (Reinforced concrete); Workability: 90 mm (slump); Specific gravity of cement: 3.15; Specific gravity of fine and coarse aggregate are 2.60 and 2.75 respectively; Water absorption of coarse ad fine aggregates are 0.5 % and 0.7% 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)* | Sl No.	Nominal Maximum Size of Aggregate mm	Entrapped Air, as Percentage of Volume of Concrete
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(1)	(2)	(3)
i)	10	1.5
ii)	20	1.0
iii)	40	0.8 | **Table 4 Water Content per Cubic Metre of Concrete For Nominal Maximum Size of Aggregate** *(Clause 5.3)* | Sl No.	Nominal Maximum Size of Aggregate mm	Water Content[1] kg
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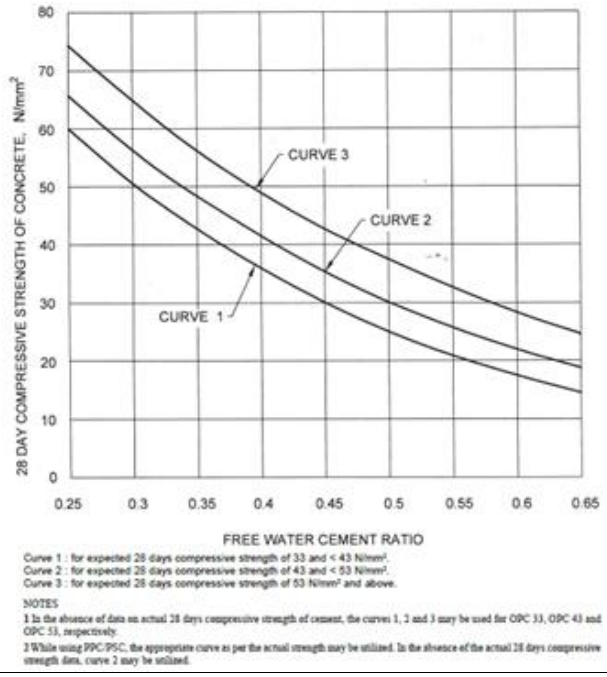
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165 | [1]Water content corresponding to saturated surface dry aggrega		**CO3**

Table 5 Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of Fi Aggregate for Water-Cement/Water-Cementitious Materials Ratio of 0.50

(*Clause* 5.5)

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate per Unit Volume of Total Aggregate for Different Zones of F 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



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.