

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: MTECH
BRANCH: CIVIL**

**SEMESTER : II
SESSION : SP/2025**

SUBJECT: CE511 ADVANCED CONCRETE TECHNOLOGY

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Use of IS code IS 10262-2019 for concrete mix design is allowed to the candidates in the examination hall.
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Q.1(a)	Differentiate between single-point and multi-point tests for assessing concrete workability, and provide examples of each.	[5]	CO	BL
Q.1(b)	What is the purpose of the Bogue calculation in cement chemistry, and why is it important in the cement industry?	[5]		Analyze Understand
Q.2(a)	Describe the mechanism of water-reducing admixtures (WRAs) in dispersing cement particles, differentiating between electrostatic repulsion and steric hindrance.	[5]	CO2	Analyze
Q.2(b)	Explain the two primary mechanisms through which retarders function to delay the setting of concrete.	[5]	CO2	Understand
Q.3	Design an M25 grade concrete mix as per IS 10262:2019 for a reinforced concrete structure subjected to moderate exposure conditions. The following material properties are provided: (i) Cement: OPC 43 grade, specific gravity = 3.15 (ii) Fine Aggregate: Natural river sand, Zone II, specific gravity = 2.65, water absorption = 1.2%, moisture content = 0.5% (iii) Coarse Aggregate: Crushed angular aggregates (20 mm nominal size), specific gravity = 2.74, water absorption = 0.5%, moisture content = 0.2% (iv) Water: Potable water (v) Chemical Admixture: Superplasticizer conforming to IS 9103, dosage = 1% by weight of cement, expected water reduction = 20% (vi) Required Workability: Slump = 75-100 mm (vii) Concrete is to be placed using mechanical vibration. Determine the mix proportions per cubic meter of concrete.	[10]	CO3	Apply
Q.4(a)	Discuss the reasons why permeability has gained increased importance in modern construction practices.	[5]	CO4	Analyze
Q.4(b)	Describe the test procedure and explain the significance of the sorptivity test for concrete.	[5]	CO4	Understand & Apply
Q.5(a)	Describe aerated concrete and no-fines concrete. Also mention their application.	[5]	CO5	Understand
Q.5(b)	How use of self compacting concrete is beneficial compared to normal concrete?	[5]	CO5	Analyze