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

CLASS: BTECH **SEMESTER : V/ADD**
BRANCH: CIVIL **SESSION : MO/2025**

SUBJECT: CE413 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. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	You are working on a large-scale project where there is a shortage of Ordinary Portland Cement (OPC). What alternative types of cement could you consider, and how would you decide which one is most suitable?	[5]	CO1	Applying
Q.1(b)	During a quality check, you find that the cement has lumps due to moisture exposure. What tests would you perform to determine if the cement is still usable, and what criteria would you use for acceptance or rejection?	[5]	CO2	Applying
Q.2(a)	Why is accelerated curing often used in precast concrete plants, and what are the potential risks?	[5]	CO1	Understanding
Q.2(b)	If a client requests a concrete mix with a very low permeability for a water-retaining structure, how would you design the mix?	[5]	CO2	Applying
Q.3	A concrete mix has a 28-day compressive strength of 60 MPa at 18°C.	[2]	CO3	Understanding
	The same mix is cured on site under the following daily temperature cycle:	[3]		and Applying
		[5]		

Period	Duration (h)	Average Temperature (°C)
Morning–Afternoon	10	30
Late Day	8	20
Night	6	8

Assume the datum temperature as -11°C and use Plowman's Maturity equation. Plowman's Coefficients for Maturity Equation is given below:

Strength after 28 days at 18°C (MPa)	A	B
Less than 17.5	10	68
17.5 – 35.0	21	61
35.0 – 52.5	32	54
52.5 – 70.0	42	46.5

(i) Compute the maturity in °C·h accumulated after 6 days.
(ii) Estimate the compressive strength at the end of day 6.
(iii) If the structure will experience a stripping stress of 30 MPa, state whether formwork removal is acceptable at that time.

Q.4	Discuss in detail the step-by-step procedure for concrete mix design as per IS 10262:2019.	[10]	CO3	Understanding and Applying
Q.5(a)	What are the limitations of the rebound hammer test? Describe a scenario where a rebound hammer test may misrepresent the actual strength of concrete.	[5]	CO4	Analyzing
Q.5(b)	What is the principle behind the Ultrasonic Pulse Velocity test? Explain a scenario where UPV results would need to be supplemented with other NDT methods.	[5]	CO4	Analyzing

::::::24/11/2025::::::M