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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**

Branch: Civil Engineering **Duration: 3 hrs.**

Course Code: 23CV5PEACT / 22CV5PEACT **Max Marks: 100**

Course: Advanced Concrete Technology

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Explain blended and composite cements. Discuss their properties	CO1	PO1	**10**
	c)	Outline the role of aggregates in concrete. Discuss the roadmap ahead for the concrete industry to cope with severe shortage of conventional fine aggregates in the near future?	CO1	PO1	**10**
		OR			
2	a)	'LC3 cement is a modern sustainable cement', justify your agreement or disagreement with the statement.	CO1	PO1	**10**
	b)	With relevant chemical reactions, discuss the process of hydration of cement and its role in strength gain in concrete.	CO1	PO1	**10**
		UNIT - II			
3	a)	Enumerate the different high performance concrete innovated in the industry and their applications	CO2	PO1	**6**
	b)	Discuss the factors affecting the rheology of concrete	CO2	PO1	**6**
	c)	Discuss the need for self-compacting concrete in the construction industry and the requirements to produce self-compacting concrete.	CO2	PO1	**8**
		OR			
4	a)	Discuss in what way the high performance may contribute to carbon units and embodied energy in the industry.	CO2	PO1	**5**
	b)	Design a SCC mix for the following data. Grade designation M-30 Nominal size of aggregate 20 mm Type of cement: OPC 53 grade conforming to IS 269 Nominal maximum size of aggregate: 20 mm Exposure conditions as per Table 3 and Table 5 of IS 456: Severe (for RCC)	CO2	PO3	**15**

			Maximum water cement ratio-0.45 Degree of site control: Good Type of aggregate: Crushed angular aggregate Maximum cement content (OPC Content): 450 kg/m3 Type of mineral admixture Fly Ash Type of chemical admixture: PCE Slump flow class: 750 – 850 mm; Maximum cement content 450 kg/m^3 Specific gravity of cement = 3.15 Specific gravity of fly ash = 2.2 Specific gravity of fine aggregate = 2.65 Specific gravity of coarse aggregate = 2.70 Specific gravity of coarse aggregate = 1.08 Water absorption of coarse aggregate = 0.5% Water absorption of fine aggregate = 1%			
			UNIT - III			
	5	a)	Relate the mechanical properties of FRC (Fiber Reinforced Concrete) with Normal concrete. List the natural and artificial fibers used for making FRC.	*CO2*	PO1	**10**
		b)	Discuss the Importance of mineral and chemical admixtures in Ultra-high-performance concrete (UHPC).	*CO2*	PO1	**10**
			OR			
	6	a)	Briefly outline the procedure to proportion an Ultra-high-performance concrete (UHPC) mix, and mention its applications.	*CO2*	PO1	**10**
		b)	Describe and discuss the microstructural characteristics of Ultra-high-performance concrete (UHPC) mix, and compare it with that of conventional concrete.	*CO2*	PO1	**10**
			UNIT - IV			
	7	a)	Describe the reaction chemistry of alkali activated concrete.	*CO2*	PO1	**10**
		b)	Explain the methodology of mix proportioning alkali activated concrete mixes with a flow chart.	*CO2*	PO1	**10**
			OR			
	8	a)	Design geopolymer concrete (GPC) mix by assuming the Density of geopolymer concrete is 2400kg/m^3. The molarity of NaOH is - 12 The ratio of NaOH: Na_2SiO_3 - 2.0 Total water content – 140 l/m^3 Water content in Na_2SiO_3-33% Fly ash - 14% GGBS - 6% Coarse Aggregate - 60% Fine aggregate - 40%	*CO2*	PO3	**10**
		b)	Briefly discuss the materials used for production of Geo-Polymer concrete. Compare and discuss the same with conventional concrete.	*CO2*	PO1	**10**

			UNIT - V			
	9	a)	Define rheometers? Mention any three types of rheometers with their advantages and disadvantages	*CO2*	PO1	**10**
		b)	Discuss the basic rheological parameters of 3D printable concrete	*CO2*	PO1	**10**
			OR			
	10	a)	Explain the various factors affecting the rheology of fresh concrete with suitable examples	*CO2*	PO1	**10**
		b)	Compare and contrast the rheological characteristics of normal concrete, Self-compacting concrete (SCC), High performance concrete (HPC) and Ultra-high-performance concrete (UHPC).	*CO2*	PO1	**10**