

U.S.N.

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

Autonomous Institute Affiliated to VTU

**January / February 2025 Semester End Main Examinations****Programme: B.E.****Semester: V****Branch: Civil Engineering****Duration: 3 hrs.****Course Code: 20CV5PEACT****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.  
 3. Use of IS:10262:2019 and IS:456:2000 is permitted.

<b>Important Note:</b> Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.			<b>UNIT - I</b>	<b>CO</b>	<b>PO</b>	<b>Marks</b>
	1	a)	Elaborate on the requirements on pumpable Ready-mix concrete.	1	1	10
		b)	Enumerate on the materials and production process of blended cement along with their reaction mechanism.	1	1	10
			<b>OR</b>			
	2	a)	Discuss on the various sustainable materials that can be replaced for natural aggregate and discuss their workability characteristics.	1	1	10
		b)	Illustrate on the various products that can be formed using waste glass, rubber and plastics with their application in concrete.	1	1	10
			<b>UNIT - II</b>			
	3	a)	Discuss the importance of self-compacting concrete (SCC) and its fresh property requirements.	2	1	06
		b)	Design M35 grade SCC mix using IS 10262-2019 guidelines for the following data: Type of Cement = OPC 53; Nominal size of aggregate = 20mm; Exposure conditions = Mild; Slump flow class = SF3 (slump flow 760mm to 850 mm); Degree of site control = Good; Type of aggregate = Crushed angular aggregate; Total powder content = 510 kg/m <sup>3</sup> Maximum cement content = 450 kg/m <sup>3</sup> Chemical Admixture = PCE base superplasticizer; Mineral admixture = GGBFS; Specific gravity of cement = 3.15; Specific gravity of GGBFS = 2.9;	2	3	14

		Specific gravity of fine aggregate = 2.6 (SSD condition); Specific gravity of coarse aggregate = 2.7(SSD condition); Specific gravity of superplasticizer = 1.08.			
		<b>OR</b>			
4	a)	Elaborate on the various types of rheometers along with their advantages and disadvantages	2	1	06
	b)	Design M40 grade SCC mix using IS 10262-2019 guidelines for the following data: Type of Cement = OPC 53; Nominal size of aggregate = 20mm; Exposure conditions = Mild; Slump flow class = SF3 (slump flow 760mm to 850 mm); Degree of site control = Good; Type of aggregate = Crushed sub angular aggregate; Total powder content = 530 kg/m <sup>3</sup> Maximum cement content = 450 kg/m <sup>3</sup> Chemical Admixture = PCE base superplasticizer; Mineral admixture = Fly ash; Specific gravity of Fly ash = 2.1; Specific gravity of cement = 3.15; Specific gravity of Fly ash = 2.9; Specific gravity of fine aggregate = 2.6 (SSD condition); Specific gravity of coarse aggregate = 2.7(SSD condition); Specific gravity of superplasticizer = 1.08.	2	3	14
		<b>UNIT - III</b>			
5	a)	Illustrate on the mechanical properties of Steel fiber reinforced concrete when compared to normal concrete.	2	1	10
	b)	Explain the manufacturing and construction procedure for SIFCON concrete.	2	1	10
		<b>OR</b>			
6	a)	Discuss the various types of fibers along with their application.	2	1	10
	b)	Summarize the influence of type, orientation and distribution of fibers on the mechanical properties of concrete.	2	1	10
		<b>UNIT - IV</b>			
7	a)	Differentiate between High strength and High-performance concrete.	2	1	10
	b)	Discuss the material compositions and applications of Light Weight Concrete.	2	1	10
		<b>OR</b>			
8	a)	Discuss the the role of mineral admixtures on the mechanical and durability properties of high-performance concrete (HPC).	2	1	10

		b)	Explain the construction procedure of High-density Concrete along with its properties and applications.	2	1	10
			<b>UNIT - V</b>			
	9	a)	Differentiate between conventional concrete and geopolymer concrete.	2	1	08
		b)	Design a mix proportion for fly-ash based GPC using NaOH and Na <sub>2</sub> SiO <sub>3</sub> for a molarity of 10. Consider total water content as 170 liter / m <sup>3</sup> . Take ratio of Na <sub>2</sub> SiO <sub>3</sub> to NaOH as 1.5, Water content in Na <sub>2</sub> SiO <sub>3</sub> is 33%. Assume any suitable missing data and mention the same clearly	2	3	12
			<b>OR</b>			
	10	a)	Discuss the key materials used in Geo-polymer Concrete and the variation of properties based on the materials used.	2	1	08
		b)	Workout a typical mix proportion for GGBFS and Fly ash-based GPC using NaOH and Na <sub>2</sub> SiO <sub>3</sub> for a molarity of 16. Consider total water content as 175 liter / m <sup>3</sup> . Take ratio of Na <sub>2</sub> SiO <sub>3</sub> to NaOH as 2.0 and Water content in Na <sub>2</sub> SiO <sub>3</sub> is 34%. Assume any suitable missing data and mention the same clearly	2	3	12

\*\*\*\*\*