SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES (AUTONOMOUS)

QUESTION BANK

Year / Semester: II B.Tech IV Semester **Regulation: R23**

Subject and Code: CONCRETE TECHNOLOGY (23CIV241T)

SYLLABUS

CONCRETE TECHNOLOGY

Course Objectives

- Learn material sand their properties used in the production of concrete
- Learn the behavior of concrete at fresh stage
- Learn the behavior of concrete at hardened stage
- Learn the influence of elasticity, creep and shrinkage on concrete
- Learn the mix design methodology and special concretes

Course Outcomes:

CO1 Familiarize the basic in gradients of concrete and their role in the production of concrete and its behavior in the field.
CO2 Test the fresh concrete properties and the hardened concrete properties. Understand the basic concepts of concrete. Design the concrete mix by BIS method.
CO3 Evaluate the ingredients of concrete through lab test results. realize the importance of quality of concrete
CO4 Understand the behavior of concrete in various environments.
CO5 Familiarize the basic concepts of special concrete and their production and applications.

UNIT- I INGREDIENTS OF CONCRETE

CEMENTS: Portland cement–Chemical composition–Hydration, setting of cement, Fineness of cement, Structure of hydrate cement– Test for physical properties – Different grades of cements–Admixtures–Mineral and chemical admixtures–accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates–Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate–Bulking of sand–Deleterious substances– Soundness–Alkali aggregate reaction–Thermal properties–Sieve analysis–Fineness modulus–Grading curves–Grading of fine & coarse Aggregates–Maximum aggregate size- recycled aggregates-Quality of mixing water.

UNIT-II

FRESH CONCRETE: Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage .Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete.

UNIT-III

HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gel/space ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength–Relation between compression & tensile strength–Curing, Testing of Hardened Concrete: Compression test –Tension test –Factors affecting strength– Flexure test –Splitting test – Non-destructive testing methods – Codal provisions for NDT.

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UNIT-IV

ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.

UNIT- V

MIX DESIGN AND SPECIAL CONCRETES: Ready mixed concrete, Fiber reinforced concrete–Different types of fibers–Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self-healing concrete. Factors in the choice of mix proportions – Quality control of concrete- Statistical methods- Acceptance Criteria-Concepts Proportioning of concrete mixes by ACI method and IS Code method

Text books:

1. Properties of Concrete by A.M. Neville–PEARSON–4thedition
2. Concrete Technology by M.L. Gambhir. – Tata McGraw Hill Publishers, New Delhi 5th edition 2013.
3. Concrete Technology by Job Thomas, Cengage Publications,1stedition,2015

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S.No.	CO	Questions	BT
Unit I: (INGREDIENTS OF CONCRETE)			
1	**1**	What are Bouge's compounds? Explain in detail how each one of these compounds influences the strength and setting properties of cement.	**L4**
2	**1**	a. Explain heat of hydration and hydration process of cement in detail. b. Explain setting time of cement and factors effecting setting time of cement.	**L3**
3	**1**	a. Discuss the chemical composition of Ordinary Portland cement. b. Briefly explain different types of cement.	**L4**
4	**1**	a. Explain the term super plasticizers. How are they useful in concrete production? b. Explain the advantages of using plasticizers and super plasticizers in concrete making.	**L3**
5	**1**	a. Discuss the difference between the wet and dry process of manufacturing of Portland cement. b. Draw the flow diagrams for wet and dry process of manufacture of cement and explain the same.	**L5**
6	**1**	Define the term "Bulking of aggregates". Explain its significance with reference to concrete making. Explain the simple field test to determine the bulking of aggregates.	**L4**
7	**1**	a. What do you mean by soundness of aggregate? b. What is alkali-aggregate reaction? And how will it affect the concrete properties.	**L3**
8	**1**	a. How do you conduct sieve analysis on coarse aggregate in laboratory? b. Differentiate between gap grading and well grading of aggregates.	**L5**
9	**1**	Bring out the detailed classification of aggregates and explain each one of them briefly	**L4**
10	**1**	Explain different methods of measurement of moisture content of aggregates.	**L3**
11	**1**	a. What is the function of gypsum in the manufacture of cement? b. Difference between quick setting and rapid hardening cement.	**L3**

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S.No.	CO	Questions	BT
Unit II: (FRESH CONCRETE)			
1	**2**	Explain in detail the slump test with the help of a neat sketch. Discuss its merits and limitations	**L4**
2	**2**	a. What do you understand by the term "Workability"? b. Discuss the various factors affecting the workability of concrete.	**L3**
3	**2**	Explain about different methods to measure workability of concrete?	**L4**
4	**2**	Briefly explain manufacturing procedure of concrete.	**L3**
5	**2**	Explain the phenomenon of gain of strength of concrete with age.	**L5**
6	**2**	Explain the various factors affecting strength of hardened concrete.	**L4**
7	**2**	Explain the Maturity concept for strength development of concrete.	**L3**
8	**2**	Explain the relation between compression strength and tensile strength of concrete.	**L5**
9	**2**	Explain different methods of placing concrete.	**L4**
10	**2**	Explain different methods of curing procedure.	**L3**
11	**2**	Calculate the Gel/space ratio and the theoretical strength of a sample of concrete made with 500 gms of cement and 0.6 w/c ratio, on Full hydration and 70% hydration.	**L4**

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S.No.	CO	Questions	BT
		Unit III: (HARDENED CONCRETE)	
1	3	**a.** Explain Schmidt's Rebound Hammer test and the limitations and applications of the same. **b.** Explain the various pulse velocity methods and the techniques measuring the pulse velocity through concrete.	L4
2	3	What are the various factors affecting the compressive strength of concrete?	L3
3	3	Explain in detail about the rebound hammer test (NDT) that is conducted on existing structure to assess its strength with a neat diagram.	L4
4	3	Explain Creep of concrete and relation between creep and time.	L3
5	3	How the shrinkage of concrete is classified and explain each one of them briefly?	L5
6	3	Explain the procedure to conduct Modulus of elasticity test in the laboratory and explain the various factors affecting the modulus of elasticity	L4
7	3	Draw the typical stress-strain curve of concrete and explain the various modulus of elasticity.	L3
8	3	Draw the stress-strain curves for aggregate, cement paste and concrete and explain the behavior for each of them.	L5
9	3	Explain the procedure for UPV and Rebound hammer test.	L4
10	3	Explain detail about NDT.	L3
11	3	How does strength of concrete influence the modulus of elasticity and Poisson's ratio of concrete?	L3

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S.No.	CO	Questions	BT
Unit IV: (ELASTICITY, CREEP & SHRINKAGE)			
1	4	**a.** Define the term "Mix Design of Concrete" and explain its significance. **b.** Briefly discuss various methods of the mix design available in literature.	L4
2	4	Explain the mix design procedure of concrete as per ACI code Method.	L3
3	4	Design a concrete mix of M20 grade for a roof slab. Take a standard deviation of 4MPa. The specific gravities of Coarse Aggregate and Fine Aggregate are 2.67 and 2.73 respectively. The bulk density of coarse aggregate is 16020 Kg/m^3 and Fineness Modulus of Fine Aggregate is 2.76. A slump of 50mm is necessary. The water absorption of coarse aggregate is 1% and free moisture in fine aggregate is 3%. Design the concrete mix using ACI method. Assume any missing data suitably.	L4
4	4	Brief explain about factors affecting choice of mix design.	L3
5	4	Explain quality control of concrete and durability of concrete.	L5
6	4	Explain the mix design procedure of concrete as per IS code Method.	L4
7	4	Define workability. How is mixing operation is done in concrete.	L3
8	4	List out the requirements of fresh concrete and List out the usage of slump values.	L5
9	4	Explain workability scenario in light weight aggregate concrete?	L4
10	4	What are different types of fibres used in the production of Fibre Reinforced concrete?	L3
11	4	What are the light weight aggregate concrete?	L3

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S.No.	CO	Questions	BT
Unit V: (MIX DESIGN AND SPECIAL CONCRETES)			
1	5	a. What are different types of fibers used in the production of Fiber Reinforced concrete? b. With respect Fiber Reinforced concrete explains following terms i) Aspect ratio ii) Percentage volume of fiber	L4
2	5	What are various factors affecting properties of Fiber Reinforced concrete?	L3
3	5	Write applications of Fiber Reinforced concrete?	L4
4	5	Explain types of polymer concrete?	L3
5	5	Explain properties of polymer concrete?	L5
6	5	Explain high performance concrete and what are the advantages of high-performance concrete over conventional concrete?	L4
7	5	What is self-consolidating concrete? What are the materials used for SCC?	L3
8	5	Explain self-healing concrete and bacterial concrete?	L5
9	5	Explain application of polymer concrete?	L4
10	5	Explain Cellular concrete, No-fineness concrete, High density concrete. iv) Fiber Reinforced concrete	L3
11	5	What is light weight concrete? How is it produced?	L3

Note: L1-Remembering, L2-Understanding, L3-Applying, L4-Analyzing, L5-Evaluating, and L6-Creating

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The Six Levels of Bloom's Taxonomy:

1. **Remembering:** Retrieving, recognizing, and recalling relevant knowledge from long-term memory (e.g., list, define, name, locate).
2. **Understanding:** Constructing meaning, explaining ideas, or concepts (e.g., summarize, interpret, classify, compare).
3. **Applying:** Using information in new situations or implementing procedures to solve problems (e.g., solve, use, demonstrate, implement).
4. **Analyzing:** Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure (e.g., contrast, categorize, distinguish, diagram).
5. **Evaluating:** Making judgments based on criteria and standards through checking and critiquing (e.g., judge, critique, justify, defend, argue).
6. **Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure (e.g., design, construct, develop, formulate).

Instruction to Faculty Members:

- **Strictly follow the prescribed question paper template without deviation.**
- **Text book reference to quoted end of the fifth unit**
- **Set a** minimum of ten (10) **and a** maximum of fifteen (15) **subjective questions per unit. Each question shall carry** ten (10) marks**.**
- **Questions may include sub-questions as per the prescribed pattern: B.Tech: 10M** or **5M + 5M** or **6M + 4M**
- **For** M.Tech**, questions shall be set as per the following pattern only: 12M** or **6M + 6M**

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