GUJARAT TECHNOLOGICAL UNIVERSITY

BE 7 SEMESTER – OLD PAPER – S22 TO S26 – QUESTION BANK

Subject Name & Code: Retrofitting of Structures - 3170616

Chapter 1 – Introduction

Repeated Questions:

1. Definitions and Differences:

- **Q.** Define (i) Repair (ii) Restoration (iii) Retrofitting **(SUMMER 2022, 3 Marks; SUMMER 2023, 3 Marks; WINTER 2024, 7 Marks OR - combined with other terms)**
- **Q.** Mention the major points of difference between a new construction work and repair/strengthening work. **(SUMMER 2022, 7 Marks OR; SUMMER 2024, 7 Marks)**

Other Important Questions:

1. Definitions:

- **Q.** Define the following terms: (i) Durability of concrete (ii) Defect (iii) Degrading factors **(WINTER 2023, 3 Marks)**

Chapter 2 – Deterioration of concrete structures

Repeated Questions:

1. Concrete Cover and Construction/Design Errors:

- **Q.** Explain need of concrete cover in RCC structure. Give IS:456-2000 recommendations for nominal cover. **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks; SUMMER 2024, 4 Marks; WINTER 2024, 7 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 4 Marks)**
- **Q.** Enlist various construction and design errors which leads to the deterioration of concrete structure. / Reasons why RC constructions are distressed. / Causes of failure in structures. / Fatal failure of structures. **(SUMMER 2022, 7 Marks; WINTER 2022; SUMMER 2023, 7 Marks OR; WINTER 2023, 7 Marks; WINTER 2023; SUMMER 2024, 7 Marks; WINTER 2024, 7 Marks; WINTER 2025, 7 Marks; SUMMER 2026, 7 Marks)**

2. Physical and Chemical Deterioration:

- **Q.** Explain various types of physical and chemical deterioration. **(SUMMER 2022, 3 Marks OR; WINTER 2022, 3 Marks OR; SUMMER 2023, 3 Marks; SUMMER 2024, 3 Marks; WINTER 2024, 3 Marks OR; WINTER 2025, 3 Marks)**
- **Q.** Explain alkali aggregate reaction and list out preventive measures. / Define and explain the alkali-aggregate reaction. **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks OR; SUMMER 2023, 7 Marks; WINTER 2023, 3 Marks OR; WINTER 2024, 7 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Explain effect of acid attack on concrete element. **(SUMMER 2024, 3 Marks OR; SUMMER 2026, 4 Marks)**
- **Q.** Describe the impact of freezing and thawing on the RCC construction. **(WINTER 2022, 7 Marks; WINTER 2024, 7 Marks OR; WINTER 2025, 7 Marks OR; SUMMER 2026, 7 Marks)**
- **Q.** Enlist various thermal properties of concrete and explain coefficient of thermal expansion. **(WINTER 2022, 3 Marks; WINTER 2024, 3 Marks; SUMMER 2026, 3 Marks)**
- **Q.** Write a short note on Transport Mechanism of fluids into the concrete. **(SUMMER 2022, 4 Marks; WINTER 2022, 4 Marks; SUMMER 2024, 4 Marks; SUMMER 2026, 4 Marks)**

3. Corrosion of Reinforcement:

- **Q.** Explain the corrosion of reinforcement in RCC structure / Mechanism of corrosion. **(SUMMER 2022, 7 Marks; WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks; WINTER 2023, 7 Marks OR; SUMMER 2024, 7 Marks; SUMMER 2025, 7 Marks OR; SUMMER 2026, 7 Marks)**

4. Cracking and Distress:

- **Q.** Describe with neat sketches the different types of cracking observed in various RCC elements such as beams, slabs and columns. [Diagram required – refer to the original question paper] **(SUMMER 2022, 7 Marks; WINTER 2023, 7 Marks; WINTER 2024, 7 Marks; WINTER 2025, 7 Marks)**
- **Q.** Enlist causes of distress in reinforced concrete structures / Signs of distress. **(SUMMER 2022, 3 Marks OR; WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks; SUMMER 2025, 3 Marks; SUMMER 2026, 3 Marks OR)**

5. Durability of Concrete:

- **Q.** Explain the durability of concrete in detail. **(SUMMER 2023, 7 Marks; SUMMER 2024, 7 Marks OR; WINTER 2024, 7 Marks; SUMMER 2025, 7 Marks OR; WINTER 2025, 7 Marks)**

Other Important Questions:

1. Chemical Attack and Transport (Theory):

- **Q.** Explain effect of sulphates attack on concrete element. **(SUMMER 2023, 4 Marks)**
- **Q.** Explain (a) Diffusion (b) Capillary porosity. **(WINTER 2023, 3 Marks)**

2. Cracks in Structures:

- **Q.** List out different causes of cracks in masonry structures. **(SUMMER 2023, 3 Marks OR)**
- **Q.** List down various parameters which you will keep in mind while assessing the cracks in RCC members. **(SUMMER 2022, 3 Marks)**

Chapter 3 – Conditional assessment / Evaluation of structures

Repeated Questions:

1. Condition Assessment:

- **Q.** Define Condition Assessment and mention the various objectives of the condition assessment of structures. **(SUMMER 2022, 7 Marks; WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks OR; WINTER 2023, 7 Marks; SUMMER 2024, 7 Marks OR; WINTER 2025, 3 Marks; SUMMER 2026, 3 Marks)**

2. Non-Destructive and Destructive Testing:

- **Q.** Enlist various types of Non-Destructive tests and explain the working principle of any one of the NDT test method. **(SUMMER 2022, 3 Marks; WINTER 2022, 3 Marks; SUMMER 2023, 3 Marks; WINTER 2023, 3 Marks; WINTER 2024, 4 Marks; WINTER 2025, 7 Marks OR; SUMMER 2026, 3 Marks)**
- **Q.** Explain Rebound Hammer test with neat sketch / working mechanism. [Diagram required – refer to the original question paper] **(SUMMER 2023, 7 Marks; WINTER 2023, 3 Marks; SUMMER 2024, 3 Marks; SUMMER 2026, 7 Marks OR)**
- **Q.** Differentiate: Destructive testing and Non-destructive testing / Porosity and Permeability. **(SUMMER 2022, 4 Marks; WINTER 2024, 3 Marks; WINTER 2025, 4 Marks OR)**

Other Important Questions:

1. Investigation and Condition Assessment:

- **Q.** Mention any two major differences between the Preliminary investigation and Detailed investigation. **(WINTER 2023, 4 Marks)**
- **Q.** Justify the necessity of doing a structure's lifetime condition assessment. **(WINTER 2022, 3 Marks OR)**

2. Field and Laboratory Tests:

- **Q.** List out various field and laboratory tests used to determine the strength of concrete. **(WINTER 2023, 3 Marks)**
- **Q.** What is the importance of field and laboratory testing for damage assessment of structure? List out various field and laboratory tests. **(SUMMER 2025, 7 Marks)**
- **Q.** List various chemical tests performed in condition assessment survey. **(SUMMER 2025, 3 Marks OR)**
- **Q.** Write short note on: 'core sampling and testing'. **(SUMMER 2025, 3 Marks)**
- **Q.** Differentiate between the following terms: (Any two) [Data truncated in source – refer to the original question paper] **(SUMMER 2024, 4 Marks)**

Chapter 4 – Repairs, rehabilitation & Retrofitting of concrete structures

Repeated Questions:

1. Repair Materials and Selection of Repair Method:

- **Q.** Enlist various classifications of repair materials. **(SUMMER 2023, 4 Marks; SUMMER 2024, 3 Marks; WINTER 2024, 7 Marks OR; WINTER 2025, 4 Marks OR)**
- **Q.** List down various factors to be considered while selecting repair method and steps to be followed to carry out an effective repair. **(SUMMER 2022, 4 Marks; WINTER 2022, 4 Marks OR; SUMMER 2024, 4 Marks OR; SUMMER 2026, 4 Marks OR)**

2. Crack Repair, Grouting and Guniting:

- **Q.** Enlist various crack repair techniques and explain crack repair by stitching. **(SUMMER 2022, 4 Marks OR; WINTER 2022, 7 Marks; SUMMER 2023, 7 Marks OR; WINTER 2023, 4 Marks OR; SUMMER 2024, 7 Marks)**
- **Q.** Explain injection grouting for RCC buildings. **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks; SUMMER 2024, 4 Marks; WINTER 2024, 4 Marks; WINTER 2025, 3 Marks OR; SUMMER 2026, 7 Marks OR)**
- **Q.** Write a short note on procedure of Guniting / Gunning. / Discuss Gunning technique and its applications. **(SUMMER 2022, 4 Marks OR; WINTER 2024, 4 Marks; SUMMER 2025, 4 Marks OR; WINTER 2025, 3 Marks)**

3. Strengthening and Retrofitting Methods:

- **Q.** Explain column jacketing with neat sketch. [Diagram required – refer to the original question paper] **(SUMMER 2023, 4 Marks OR; SUMMER 2024, 7 Marks)**
- **Q.** Explain fibre wrap technique / method. **(WINTER 2022, 4 Marks; SUMMER 2023, 4 Marks; SUMMER 2024, 4 Marks OR; WINTER 2024, 4 Marks; SUMMER 2025, 3 Marks OR; WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks OR)**
- **Q.** Enlist various strengthening methods for beams and slabs. Explain one strengthening method in detail for both beam and slab. **(SUMMER 2022, 7 Marks OR; WINTER 2023, 7 Marks OR; SUMMER 2026, 7 Marks)**
- **Q.** List down the various techniques to strengthen the foundation. / Underpinning for foundation rehabilitation. **(SUMMER 2022, 4 Marks; SUMMER 2024, 4 Marks; SUMMER 2025 OR)**

4. Shoring and Deflected Slab:

- **Q.** Give various types of shoring and explain dead shores / raking shore with sketch. [Diagram required – refer to the original question paper] **(WINTER 2022, 7 Marks OR; SUMMER 2023, 7 Marks OR; WINTER 2024, 7 Marks OR; WINTER 2025, 7 Marks; SUMMER 2026, 3 Marks)**
- **Q.** What steps will you follow to correct a deflected RCC slab / measures to repair? **(SUMMER 2022, 3 Marks; WINTER 2023, 7 Marks; SUMMER 2024, 3 Marks OR; SUMMER 2026, 3 Marks OR)**

5. Special Concretes:

- **Q.** Write short note on vacuum concrete. **(WINTER 2022, 4 Marks; WINTER 2024, 4 Marks OR; WINTER 2025, 3 Marks; SUMMER 2026, 4 Marks)**
- **Q.** Write short note on fiber reinforced concrete. **(WINTER 2022, 7 Marks; WINTER 2024, 4 Marks; WINTER 2025, 4 Marks; SUMMER 2026, 7 Marks)**
- **Q.** Write short note on polymer impregnated concrete. **(SUMMER 2024, 3 Marks; WINTER 2024, 3 Marks; WINTER 2025, 3 Marks OR)**

6. Leakage and Under-water Repairs:

- **Q.** How to carry out repairs of leakage from terrace? **(WINTER 2022, 4 Marks OR; SUMMER 2023, 4 Marks OR; SUMMER 2024, 4 Marks OR; WINTER 2024, 4 Marks OR; WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks OR)**

- **Q.** How do you carry out under-water repairs / Write short note on Under-water repairs. **(SUMMER 2022, 7 Marks; SUMMER 2024, 7 Marks OR)**

7. Differentiation:

- **Q.** Differentiate: (i) Repair and Retrofitting (ii) Active crack and Passive crack (iii) Drying shrinkage and Plastic shrinkage. **(SUMMER 2022, 4 Marks; WINTER 2024, 7 Marks OR; WINTER 2025, 7 Marks OR)**

Other Important Questions:

1. Repair Materials and Special Concretes (Other):

- **Q.** State the important characteristics required for a repair material to be durable. **(WINTER 2023, 4 Marks)**
- **Q.** Write short note on: 'Crack sealing materials'. **(SUMMER 2025, 3 Marks)**
- **Q.** Write short note on polymer Portland cement concrete. **(SUMMER 2023, 3 Marks OR)**
- **Q.** Write short Note on: 'Sulphur Infiltrated concrete'. **(SUMMER 2025, 4 Marks)**
- **Q.** Write short note on: 'Polymer concrete'. **(SUMMER 2025, 4 Marks OR)**

2. Repair Techniques and Strategy (Other):

- **Q.** Explain crack repair by Routing and Sealing. **(SUMMER 2025, 3 Marks)**
- **Q.** Explain crack repair by Grouting. **(SUMMER 2025, 4 Marks)**
- **Q.** Explain the methodology to repair an earthquake deficient masonry structure. **(SUMMER 2025, 4 Marks)**
- **Q.** Explain various points to be considered before arriving at the repair strategy. **(SUMMER 2025, 7 Marks)**
- **Q.** What is jacketing? Explain different types of jacketing. **(SUMMER 2025, 7 Marks)**

Chapter 5 – Allied topics

Repeated Questions:

1. Maintenance:

- **Q.** Explain Routine and Periodic maintenance. **(SUMMER 2022, 3 Marks OR; SUMMER 2024, 3 Marks; WINTER 2024, 3 Marks OR; WINTER 2025, 3 Marks; SUMMER 2026, 3 Marks)**
- **Q.** Explain Day to Day repair as per CPWD. **(SUMMER 2023, 3 Marks; WINTER 2024, 3 Marks OR; WINTER 2025, 4 Marks)**

2. Quality Control and Corrosion Mitigation:

- **Q.** How would you ensure Quality control in Concrete construction? **(SUMMER 2022, 4 Marks; SUMMER 2023, 4 Marks OR; WINTER 2023, 4 Marks; SUMMER 2024, 3 Marks OR; WINTER 2024, 4 Marks OR; WINTER 2025, 4 Marks; SUMMER 2026, 4 Marks)**
- **Q.** List out various corrosion mitigation techniques and explain any one of them. **(SUMMER 2023, 7 Marks OR; SUMMER 2025, 7 Marks OR)**

Other Important Questions:

1. Maintenance and Building Defects:

- **Q.** Explain various types of maintenance. **(SUMMER 2023, 7 Marks)**
- **Q.** Importance of building maintenance. List the activities covered in building maintenance. **(SUMMER 2025, 3 Marks)**
- **Q.** Explain various types of defects in building. **(SUMMER 2025, 3 Marks OR)**
- **Q.** Explain the structural defects in masonry building. How can it be prevented? **(SUMMER 2025, 4 Marks OR)**

Uncategorised Questions

(These questions encompass multiple chapters or could not be definitively mapped to a single chapter as per the given syllabus)

Repeated Questions:

None identified.

Other Important Questions:

1. Short Answer and Objective Questions:

- **Q.** Answer in short: (Any Seven) (i) Periodic maintenance (ii) Design philosophy for Retrofitting (iii) Surface preparation before repairs (iv) Under-water repairs (v) Pre-placed aggregate concrete (vi) Application of resin by pressure injection (vii) Local & Global deficiencies in structures (viii) Causes of dampness in buildings (ix) Classification of cracks **(WINTER 2023, 7 Marks)**
- **Q.** Attempt Following (Multiple Choice / Fill in the blanks): (i) Main reason of crack in concrete during fresh stage of concrete is .... (ii) The value of Ultrasonic pulse velocity should be .... (iii) The sulphate attack can be controlled by use of .... (iv) In R.C.C. alkalinity of concrete should be maintained above .... (v) Fibers generally reduce .... (vi) The freezing water in pores of concrete expands about .... (vii) The most common symptom of distress in concrete is .... **(SUMMER 2025, 7 Marks)**

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