

Reg. No. :

Question Paper Code : 71538

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Eighth Semester

Civil Engineering

CE 6021 — REPAIR AND REHABILITATION OF STRUCTURES

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List down the main objectives of maintenance of buildings.
2. State the causes of deterioration in reinforced concrete structures.
3. Distinguish between structural cracks and non-structural cracks with an example.
4. In what way carbonation of concrete affects the structures?
5. State the merits and applications of sulphur infiltrated concrete in construction practice.
6. Why fibre reinforced concrete is preferred in water retaining structures, blast resistant structures and repair and rehabilitation works?
7. Under what situations the use of underpinning is warranted?
8. Enumerate the advantages of cathodic protection system over conventional method of repetitive repair and replacement.
9. Write the typical ranges of Thermal conductivity, Thermal diffusivity, Specific heat, coefficient of thermal expansion of ordinary concrete.
10. List the pre-planning activities to be done before demolition of a structure.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the various categories of inspection based on method and interval. (6)
- (ii) Draw a flowchart of the general approach adopted pre-repair evaluation of distress concrete structures. (10)

Or

- (b) (i) Prepare a report on damage classification of the structural members based on the output of preliminary investigation. (12)
- (ii) Differentiate between repair and rehabilitation of building. (4)
12. (a) (i) List the functions of quality control during concrete construction. (8)
- (ii) How materials, water-cement ratio, placement of reinforcing steel, formwork, curing, vibration and compaction influence the quality control of the structure? (8)

Or

- (b) (i) Explain the importance of concrete cover in RCC structures. Give recommendations of IS 456-2000 for nominal cover. (8)
- (ii) List various construction and design deficiency which causes distress in the RCC structure. (8)
13. (a) (i) Under what circumstances vacuum treatment is given to concrete? Explain with neat sketch the arrangement for vacuum treatment of concrete with its merits and applications in construction practice. (10)
- (ii) Summarize the sequence of operation in preparation of polymer-impregnated concrete elements. (6)

Or

- (b) Explain briefly the materials, mechanisms and behavior of fresh and hardened state of High performance concrete. Also indicate their merits and demerits in construction practice.
14. (a) (i) List the significance of performance and integrity test on concrete and explain any one method in detail. (8)
- (ii) How to estimate the strength of concrete in existing structure? Explain the method in which the longitudinal pulse velocity (km/s) is used to predict the quality of concrete. (8)

Or

- (b) (i) Write the step by step procedure adopted in epoxy injection for repair works. (8)
- (ii) Enumerate the types of shoring and describe the use of raking shore under the following :
- (1) To support unsafe walls for a building, with the height of 12 meters
- (2) To support unsafe walls of a building with height of 8 meters. (8)

15. (a) (i) Explain the procedure for demolishing main structural members like columns, beams and slabs with the help of neat sketch. (12)
- (ii) What are the allied activities accompanying the demolition process? (4)

Or

- (b) (i) Under what condition strengthening of foundation is required? Explain how columns strengthened by section enlargement technique with the help of neat sketch? (8)
- (ii) What are the precautions to be taken to prevent water leakage in roofs/flat roofs and sunken floors in toilet? (8)



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Question Paper Code : 40763

23/04/2018
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B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018
Eighth Semester
Civil Engineering
CE 6021 – REPAIR AND REHABILITATION OF STRUCTURES
(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. Define maintenance.
2. List out any four causes of deterioration of structures.
3. What are the factors that affect the durability of concrete ?
4. State the importance of cover thickness in concrete.
5. List the types of Polymer concrete.
6. What is meant by Geo-polymer concrete ? List the materials used for making geopolymer concrete.
7. What is the purpose of underpinning ?
8. State the properties of corrosion inhibitors.
9. List the methods adopted to overcome low member strength in concrete structures.
10. Name any four Engineered demolition techniques for RC Structures.



PART – B

(5×16=80 Marks)

11. a) Explain the steps involved in the assessment procedure for evaluating the damages and to carry out rehabilitation work.
- (OR)
- b) Write the various aspects of inspection.
12. a) Explain the different types of cracks found in concrete structures. Also list the remedial measures.
- (OR)
- b) Discuss the effects of temperature and climate on concrete structures.
13. a) Explain the manufacturing process, properties and uses of High performance concrete.
- (OR)
- b) Explain in detail
- i) Self Compacting Concrete. (8)
 - ii) Polymer Concrete. (8)
14. a) Write elaborate notes on the following Non Destructive testing techniques as per IS.
- i) Rebound Hammer test. (8)
 - ii) Ultrasonic pulse velocity. (8)
- (OR)
- b) Write short notes on mechanism of
- i) Epoxy injection. (8)
 - ii) Underpinning. (8)
15. a) Discuss the impulsion method of demolition of structures.
- (OR)
- b) How do you repair and rehabilitate a structure damaged due to fire ?

PART C — (1 × 15 = 15 marks)

16. (a) Discuss the assessment procedure for repair and strengthening of RCC structure constructed in coastal region in the year 2009. which was damaged due to cyclone, the structures were damaged in the following forms :
- Reinforcement corrosion
 - Leaking drainage pipes.
 - Stagnated water on terraces
 - Spalling of concrete
 - De-bonding of plaster at surfaces

Or

- (b) Illustrate the procedure for demolishing the main structural members like columns, beams and slabs of RCC structure without disturbing the nearby structures. The building was constructed in the year 1990 located in northern part of India with car parking at basement

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Question Paper Code : 52749



B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Eighth Semester

Civil Engineering

CE 6021 — REPAIR AND REHABILITATION OF STRUCTURES

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

- Compare preventive maintenance and routine maintenance with an example.
- List the various aspects to be investigated during inspection of existing building.
- Distinguish between structural cracks and non-structural cracks.
- How thermal variations affect the durability of structures?
- Differentiate filling ability and passing ability of self compacting concrete.
- Enumerate the methods of producing high strength concrete.
- Mention some of the situations which demand underpinning.
- Why reinforcement is coated in RCC structures?
- Demonstrate crack repair by routing and sealing with help of neat sketch.
- Suggest the guidelines for construction in different seismic zones.

PART B — (5 × 13 = 65 marks)

11. (a) (i) State the objectives and factors influencing maintenance. (6)
- (ii) Demonstrate the systematic approach to diagnosis the defects in RC buildings with the help of flow chart. (7)

Or

- (b) (i) Prepare the report on assessment of damage due to severe earthquake on G + 4 reinforced concrete frame building with Ground floor as parking constructed in year 1988-1989. (7)
- (ii) Illustrate the deterioration mechanism with the help of neat sketch. (6)
12. (a) (i) What do you understand by the term durability? Compared to the other considerations, how much importance should be given to durability in the design and construction of concrete structures? (4)
- (ii) How the properties of aggregate — both fine and coarse, and cement, affect the relationship of water demand on slump, and the water-cement ratio and compressive strength? (9)

Or

- (b) (i) Ideally, from the standpoint of crack resistance, a concrete should have low shrinkage and high extensibility. Give examples to show why this may not be possible to achieve in practice. (7)
- (ii) Illustrate the significance of the carbonation of concrete, passivity of steel and state of oxidation of iron with respect to the corrosion of steel in concrete. (6)
13. (a) (i) Demonstrate the arrangement for vacuum treatment of concrete with its advantage and applications. (7)
- (ii) How polymerization is achieved in polymer concrete? Explain in detail. (6)

Or

- (b) Why it is advantage to use fibre reinforced concrete for the following construction works: (13)
- (i) Water retaining structures
- (ii) Blast resistant structures
- (iii) Precast products
- (iv) Pavement and floors
- (v) Repair and rehabilitation works.

14. (a) (i) Why the following factors affect the pulse velocity measurement? (6)
- (1) Reinforcing steel
- (2) Temperature of concrete
- (3) Path length.
- (ii) What are the principles behind the following test procedures : rebound hammer, pull out test, Windsor probe test? Explain which you would recommend for deciding the formwork removal time. (7)

Or

- (b) (i) List the types of shoring and discuss the use of raking shore under the following cases by neat sketch. (8)
- (1) To support a wall of multi-storeyed structure on road side leaving roadside margins.
- (2) To support a wall of multi-storeyed structures by the side of heavy traffic road.
- (ii) Explain cathodic protection mechanism with the help of neat sketch. (5)
15. (a) (i) Discuss the following methods of crack repair. (6)
- (1) Concrete replacement
- (2) Mortar replacement
- (3) Resin based repairs
- (ii) Illustrate the rehabilitation procedure of fire damaged following elements : (7)
- (1) Eccentrically loaded columns
- (2) RCC slabs and beams.

Or

- (b) (i) How cracked reinforced concrete elements are repaired by providing additional steel? Explain it with neat sketch. (6)
- (ii) Illustrate the stitching procedure to repair the flexural cracks in slab and beam with the help of neat sketch. (7)

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PART – B

(5×16=80 Marks)

11. a) Discuss the procedure of assessment for evaluating a damaged structure bringing out the vital components at each stage. (16)
- (OR)
- b) Briefly discuss the various causes of distress in concrete structures mentioning its effects. (16)
12. a) Give a detailed note on the property “strength” of concrete discussing its influencing factors and discuss any two methods to enhance it. (16)
- (OR)
- b) List the various types of corrosion in concrete discussing its phenomena, causes and effects. Also suggest any one method of protection against each type of corrosion. (16)
13. a) Discuss the method of manufacture, properties and uses of Sulphur Infiltrated Concrete. (16)
- (OR)
- b) Describe the method of manufacture, properties and uses of Fibre reinforced concrete. (16)
14. a) Describe the process of rebar corrosion in concrete. Also discuss the various techniques of its corrosion protection. (16)
- (OR)
- b) Define the term underpinning. Discuss any two of its methods mentioning its applicability. (16)
15. a) List the various methods of Engineered demolition of structures with applicability and discuss any two of the methods in detail. (16)
- (OR)
- b) Take a case study of a building affected by fire and discuss its various effects. Also suggest suitable methods of remedy. (16)



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Question Paper Code : 91284

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019
Eighth Semester
Civil Engineering
CE 6021 – REPAIR AND REHABILITATION OF STRUCTURES
(Regulations 2013)

SI

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. State the factors influencing maintenance of buildings.
2. Enumerate the information required before inspecting the buildings.
3. How to minimize thermal cracking in concrete ?
4. Summarize the effects of cover thickness in buildings.
5. Why steel fibre-reinforced concrete is used in tunnel linings ?
6. How to reduce shrinkage and its effect by appropriate curing of High performance concrete ?
7. Using ultrasonic pulse velocity method, how defects are detected in RC buildings.
8. Summarize the necessary properties of the protective coatings over structural concrete.
9. List the essential parameters for repair materials.
10. Draw the layout of surface repairs for loose and delaminated concrete portion in buildings as shown in figure 1.

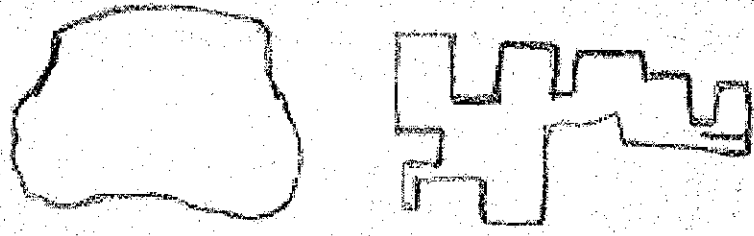


Figure 1



PART – B

(5×13=65 Marks)

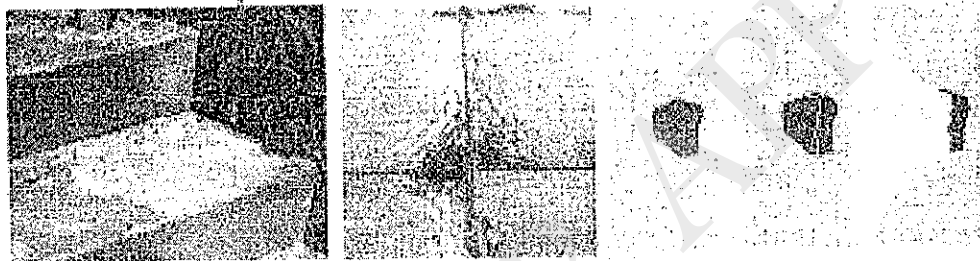
11. a) Illustrate the intrinsic and extrinsic causes and stages of distress in structures.

(OR)

b) Draw the flowchart to demonstrate the process of condition assessment in buildings.

12. a) i) State the condition under which freeze thaw disintegration takes place in concrete. (4)

ii) Explain the damages shown in figure 2 produced as a result of cyclic freezing and thawing (Figure 2 (a) Concrete steps (b) Concrete Pavement (c) Aggregate particle in concrete) (9)



(a)

(b)

(c)

Figure 2

(OR)

b) With respect to corrosion of steel in concrete. Explain the significance of following :

- a) Carbonation of concrete
- b) Passivity of steel
- c) Corrosion of Embedded steel in concrete
- d) Electrical resistivity of concrete

13. a) State the significance of using polymer modified concrete in the following field applications (i) Structural repair to RCC buildings (ii) Anti washout underwater concreting (iii) Protective Anti corrosive and water proofing coatings.

(OR)

b) A heavily reinforced and massive concrete structure is to be designed for a coastal location in Tuticorin. As a civil engineer, write a report explaining the state of the art on the choice of concrete with cement type, aggregate size, admixtures, mix proportions, concrete placement and concrete curing procedures.



14. a) i) List four non-destructive test methods for the evaluation of concrete quality. Which one can be used as a direct substitute for determining the compressive strength of concrete ? (9)
- ii) Under what situations the use of underpinning is recommended ? Also state the methods of underpinning. (4)
- (OR)
- b) i) Explain the principle and mechanism of cathodic protection technique. (9)
- ii) Why cathodic protection technique has been tried in buildings only to limited extent, when compared to bridges and parking garages ? (4)
15. a) i) How pre-placed aggregate concrete is used for repairing the concrete wall ? Explain in detail with the help of neat sketch. (5)
- ii) Demonstrate the principal effects of fire on beam with buckling of reinforcing steel, cracking from excessive bending and connections to other members experiences moment and thrust strains with the help of neat sketch. (8)
- (OR)
- b) i) Illustrate the following methods used for rehabilitation of concrete structures (i) Plate bonding (ii) RCC Jacketing. (6)
- ii) How to strengthen the RCC column with respect to (i) Load carrying capacity (ii) Ductility ? Explain with the help of neat sketch. (7)

PART – C

(1×15=15 Marks)

16. a) Prepare the sequence of operations required for the following problems in the RCC structures : (i) damaged structural members like minor/hair cracks or spalling from beams and columns, where carbonation depth in cover concrete has not reached reinforcement level (ii) Leakage from terraces.
- (OR)
- b) Explain the following situations, which occur due to thermal effects in concrete structures. (i) A change of 38°C in a 30.5 m length of beam will change the overall length by 22 mm. (ii) A precast double T-shaped structured member with 18 m span can move 19 mm upward at mid span from normal diurnal solar heating, causing the ends to rotate and stress the ledger beam bearing pads and concrete. (iii) A structural element made of freshly placed concrete and restrained at both ends. (iv) A beam with an existing crack. Support your answers with neat sketches.