



**M.E DEGREE EXAMINATIONS: DEC 2015**

(Regulation 2014)

Third Semester

**STRUCTURAL ENGINEERING**

P14SETE16: Maintenance and Rehabilitation of Structures

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. Assertion (A): The corrosion of embedded steel reinforcement is more rapid when the concrete member is immersed in acidic solution. CO1 [K<sub>3</sub>]  
Reason (R): Corrosion in steel will not take place at relative humidity less than 40%.  
a) Both A and R are individually true and R is the correct explanation of A. b) Both A and R are individually true and R is not the correct explanation of A.  
c) A is true but R is false. d) A is false but R is true.
2. The presence of cracks in concrete drastically CO2 [K<sub>2</sub>]  
a) Reduces the initiation time of corrosion b) Increases the initiation time of corrosion  
c) Reduces the propagation time of corrosion d) Increases the propagation time of corrosion
3. The main aim of maintaining any structure is to CO3 [K<sub>2</sub>]  
a) Improve its appearance b) Utilize the funds provided  
c) Stabilize the structure d) Utilize services on in-charge maintenance
4. Match list I with list II and select the correct answer using the codes given below. CO2 [K<sub>3</sub>]

List I	List II
A. Protects steel from rusting	1. Crowning
B. More oil in paint causes	2. Red lead
C. Termite makes the timber	3. Porous
D. Bulging of tile floors	4. Wrinkling

	A	B	C	D
a)	2	1	3	4
b)	3	4	2	1
c)	2	4	3	1
d)	3	1	2	4

5. Assertion (A): The treatment of a surface to prevent the passage of liquid water under hydrostatic pressure is called water proofing. CO3 [K<sub>3</sub>]

Reason (R): Damp proofing can be achieved by the use of expansive cement.

- |    |   |    |   |
|----|---|----|---|
| a) | Both A and R are individually true and R is the correct explanation of A. | b) | Both A and R are individually true and R is not the correct explanation of A. |
| c) | A is true but R is false.   | d) | A is false but R is true.   |

6. Fibres generally reduces CO4 [K<sub>2</sub>]

- |    |                   |    |                  |
|----|-------------------|----|------------------|
| a) | Compressive creep | b) | Tensile strength |
| c) | Shrinkage creep   | d) | Shear strength   |

7. Consider the following statements. CO4 [K<sub>3</sub>]

1. The technique of epoxy injection is used for repairing hydraulic structures.
2. Dry pack is used for the repair of growing cracks.
3. Shotcrete contains well graded aggregate of 10mm or less in size.
4. The repair of concrete is achieved by replaced concrete technique.

Which of these statements are correct?

- |    |     |    |     |
|----|-----|----|-----|
| a) | 1,3 | b) | 1,4 |
| c) | 1,2 | d) | 2,3 |

8. Assertion (A): Polymer modified cementitious materials are used for a repair of concrete structures up to a depth between 25 – 30 mm. CO3 [K<sub>3</sub>]

Reason (R): Polymeric resins are derived from the petrochemical industry.

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|----|---|----|---|
| a) | Both A and R are individually true and R is the correct explanation of A. | b) | Both A and R are individually true and R is not the correct explanation of A. |
| c) | A is true but R is false.   | d) | A is false but R is true.   |

9. Fire resistant coatings applied on structural elements are called CO4 [K<sub>2</sub>]

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|----|----------------------|----|---------------------|
| a) | Intumescent coatings | b) | Bituminous coatings |
| c) | Epoxy coatings       | d) | Neoprene coatings   |

10. Consider the sequence of strengthening by SIMCON. CO4 [K<sub>4</sub>]

1. The beam-column joint to be rehabilitated is chosen.
2. Rebars wrapped in SIMCON are put along the column.
3. Additional layers of SIMCON mat are added.

4. Entire column is jacketed with SIMCON.

The correct sequence of the dismantling walls is

- |            |            |
|------------|------------|
| a) 2-3-4-1 | b) 1-3-2-4 |
| c) 3-4-2-1 | d) 4-1-3-2 |

**PART B (10 x 2 = 20 Marks)**

- |  |     |                   |
|--|-----|-------------------|
| 11. Explain the preventive measures taken against freezing damage.   | CO1 | [K <sub>2</sub> ] |
| 12. Report the applications of a cover meter.                        | CO1 | [K <sub>2</sub> ] |
| 13. Explain remedial maintenance.                                    | CO2 | [K <sub>2</sub> ] |
| 14. Discuss the various testing techniques of hardened concrete.     | CO2 | [K <sub>2</sub> ] |
| 15. List the properties considered when selecting a repair material. | CO4 | [K <sub>2</sub> ] |
| 16. Differentiate between accelerators and retarders.                | CO2 | [K <sub>3</sub> ] |
| 17. Discriminate the types of crack.                                 | CO3 | [K <sub>2</sub> ] |
| 18. Discuss the advantages of dry packing.                           | CO4 | [K <sub>2</sub> ] |
| 19. Illustrate the damages caused due to fire in concrete.           | CO3 | [K <sub>3</sub> ] |
| 20. List the effects of concrete structures in marine atmosphere.    | CO3 | [K <sub>3</sub> ] |

**PART C (10 x 5 = 50 Marks)**

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|---|-----|-------------------|
| 21. List the parameters which influence the corrosion process.  | CO1 | [K <sub>3</sub> ] |
| 22. Differentiate between design and construction errors.   | CO1 | [K <sub>3</sub> ] |
| 23. Explain the causes which necessitate the maintenance that affect the service and durability of the structure.   | CO2 | [K <sub>2</sub> ] |
| 24. Explain the various inspection periods for a maintenance programme.   | CO2 | [K <sub>2</sub> ] |
| 25. Illustrate the applications of mineral admixtures as a repair material.   | CO4 | [K <sub>3</sub> ] |
| 26. Explain about polymer concrete.   | CO4 | [K <sub>3</sub> ] |
| 27. Explain about epoxy coatings for reinforcement.   | CO3 | [K <sub>3</sub> ] |
| 28. A School building is situated in marine environment. Analyze the corrosion mechanism and identify any two corrosion protection techniques.                                    | CO3 | [K <sub>4</sub> ] |
| 29. Analyze the safety measures adopted in building maintenance.  | CO4 | [K <sub>4</sub> ] |
| 30. The RC beams and slabs of an office building possess low member strength. Appraise the method of externally bonding technique with mild steel plates to enhance the strength. | CO4 | [K <sub>5</sub> ] |

**PART D (2 x 10 = 20 Marks)**

31. Categorize and explain various demolition techniques. CO4 [K<sub>4</sub>]
32. Shoring and underpinning CO3 [K<sub>4</sub>]

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