

**REPAIR & REHABILITATION OF STRUCTURES
(CIVL 3221)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Shrinkage in concrete caused due to rapid evaporation is known as
 - (a) Autogenous Shrinkage
 - (b) Drying Shrinkage
 - (c) Chemical Shrinkage
 - (d) Plastic Shrinkage.
 - (ii) Factors that cause(s) deterioration of concrete structure is/are
 - (a) Physical causes
 - (b) Chemical causes
 - (c) Design and construction errors
 - (d) All of the above.
 - (iii) Corrosion of reinforcing bars is caused by
 - (a) Chloride induced corrosion and Carbonation induced corrosion
 - (b) Alkali-aggregate reaction and alkali-silica reaction
 - (c) Both (a) and (b)
 - (d) Shrinkage in concrete.
 - (iv) Crack width ranging between 1mm to 2mm is known as:
 - (a) Fine cracks
 - (b) Medium cracks
 - (c) Wide cracks
 - (d) Spalling.
 - (v) Erosion due to cavitation on concrete surfaces occurs when:
 - (a) velocity of flow of water > 10 m/s
 - (b) velocity of flow of water > 20 m/s
 - (c) velocity of flow of water > 12 m/s
 - (d) velocity of flow of water > 5 m/s
 - (vi) In Rebound hammer test of concrete, the quality of concrete is regarded as good layer when the average rebound number is
 - (a) Greater than 40
 - (b) Less than 20
 - (c) Ranges between 30-40
 - (d) Ranges between 20-30.
 - (vii) Latex, used in concrete repair, should be limited within
 - (a) 10% by weight of cement
 - (b) 5% by weight of cement
 - (c) 20% by weight of cement
 - (d) 2.5 % by weight of cement.

- (viii) Fibre-reinforced concrete is usually used in concrete to
 - (a) Increase the compressive strength of concrete
 - (b) Increase the flexural strength of concrete
 - (c) Reduce voids in concrete
 - (d) Both (a) and (b)
- (ix) Strengthening of structures include:
 - (a) Improving ductility and stiffness
 - (b) Increasing strength of the existing structures
 - (c) Improvement in aesthetic view
 - (d) Both (a) and (b).
- (x) Steel jacketing of beams and columns comes under:
 - (a) Repair Technique
 - (b) Retrofitting Technique or strengthening technique
 - (c) Rehabilitation technique
 - (d) Both (a) and (b).

Group – B

- 2. (a) Define Rehabilitation of structures. Differentiate between repair and retrofitting.
(b) Explain the various causes of damage and deterioration in concrete.

$(2 + 2) + 8 = 12$
- 3. (a) What is/are the effects of selecting poor quality of materials in construction?
(b) Explain the following in details:
 - (i) Effect of creep in concrete
 - (ii) Temperature effect in concrete
 - (iii) Different types of chemical attacks in concrete.

$3 + (3 \times 3) = 12$

Group – C

- 4. (a) Mention the steps involved in repairing works.
(b) Describe the steps in the assessment procedure to evaluate damages in the structures.
(c) Explain the following: -
 - (i) Seepage through joints and the effect of sealing.
 - (ii) Non-destructive tests for concrete.

$3 + 3 + (3 + 3) = 12$
- 5. (a) Explain various stages for “defect diagnosis” in a flow chart.

- (b) Describe the process for conducting Ultrasonic pulse velocity Test on concrete samples.
- (c) Explain the following (*Any two*):
- (i) Polymer mortars
 - (ii) Application of ferrocement in construction industry
 - (iii) Polymer Modified concrete
 - (iv) SIFCON and SIMCON.

4 + 4 + 4 = 12**Group – D**

6. (a) Describe briefly about few repair materials used for concrete based on their various categorization.
- (b) Explain briefly about different types or repairing techniques to be conducted on damaged concrete structures.
7. (a) State vividly the various aspects to be considered before going for retrofitting work of concrete structures, both considering the entire structure and also considering some parts of the structure only.
- (b) Demonstrate the process of Concrete Jacketing work for a concrete column with the help of sketches.

6 + 6 = 12**7 + 5 = 12****Group – E**

8. (a) Explain about different types of irregularities generally observed in a R.C.C. building, both in plan and in elevation.
- (b) Describe with the help of sketches about different types of infill walls, like (i) Shear Wall, (ii) Wing Wall and (iii) Buttress Wall.
9. (a) Explain with the help of sketches about different types of retrofitting works that can be taken up for a shallow foundation.
- (b) Describe, with the help of sketches, about different types of retrofitting works that can be taken up for pile foundations.

6 + 6 = 12**5 + 7 = 12**

Department & Section	Google classroom joining code	Submission Link
CE Sec A	7grk4n4	https://classroom.google.com/u/0/c/Mjk3MjUyMDY2Mjc2/a/MzY0NDIxNjE4Njk0/details
CE Sec B	7vtoifr	https://classroom.google.com/u/0/c/Mjk3MjUyMDY2Mzly/a/MzY0NDIxNjE4Nzg4/details