

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

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

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

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Which method is commonly used for strengthening reinforced concrete beams?
(a) Jacketing (b) Cathodic protection
(c) Grouting (d) Sandblasting
- (ii) Which type of deterioration is primarily caused by the chemical reaction between concrete and acidic environments?
(a) Alkali-silica reaction (b) Sulfate attack
(c) Carbonation (d) All of options (a), (b) and (c)
- (iii) What is the primary goal of repair, rehabilitation, and retrofitting of buildings?
(a) To increase the building's lifespan
(b) To enhance the building's structural integrity
(c) To improve the building's energy efficiency
(d) All of the above.
- (iv) Shrinkage in concrete caused due to rapid evaporation is known as
(a) Autogenous Shrinkage (b) Drying Shrinkage
(c) Chemical Shrinkage (d) Plastic Shrinkage
- (v) Crack width ranging between 1mm to 2mm can be classified as
(a) Fine cracks (b) Medium cracks
(c) Wide cracks (d) Spalling
- (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 to 40 (d) Ranges between 20 to 30.
- (vii) 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 options (a) and (b)

- (viii) What is the purpose of surface preparation before concrete repair?
 (a) Improves bond between old and new concrete
 (b) Remove contaminants and loose material
 (c) Increase concrete strength
 (d) Reduce repair time.
- (ix) Mortar or concrete conveyed through pressure hose and applied pneumatically at high velocity on to a surface is called
 (a) Shoring (b) Guniting (c) Sealing (d) Jacketing
- (x) What is the technique known as "**jacketing**" used for in structural retrofitting?
 (a) Strengthening the structure by encasing it with additional material
 (b) Improving the foundation by applying epoxy resin
 (c) Enhancing energy efficiency using thermal insulation
 (d) Protecting against corrosion by applying coatings.

Fill in the blanks with the correct word

- (xi) The relevant IS code for ultrasonic pulse velocity test is _____.
- (xii) For moderate exposure, the nominal cover to RCC members should be _____.
- (xiii) The environmental factor which accelerates the corrosion of reinforced concrete structures _____.
- (xiv) Spalling in concrete structures is caused due to _____.
- (xv) _____ common technique used to improve earthquake resistance of a building.

Group - B

2. (a) Provide the road map to repair of a structure. [[CO2](Analyse/HOCQ)]
 (b) Describe the effect of internal causes on durability of concrete? [[CO1,CO2](Analyse/HOCQ)]
 (c) Define Shrinkage of concrete. [[CO2](Remember/LOCQ)]
 (d) Describe the factors influencing the drying shrinkage? [[CO2](Apply/IOCQ)]
4 + 4 + 2 + 2 = 12
3. (a) Explain with diagram the various patterns of cracks in Masonry and Concrete building members. [[CO3](Analyse/HOCQ)]
 (b) Explain various types of chemical attacks in concrete structures. [[CO3](Remember/LOCQ)]
6 + 6 = 12

Group - C

4. (a) Distinguish between Repair and Rehabilitation. [[CO1,CO2](Remember/LOCQ)]
 (b) Mention various causes of distress in concrete structures. [[CO1,CO2](Remember/LOCQ)]
6 + 6 = 12
5. (a) Describe in brief about various non-destructive tests in concrete [[CO4,CO5,CO6](Remember/LOCQ)]

(b) With neat sketches, write short notes on:

(i) Electrical resistivity test

(ii) Ultrasonic Pulse velocity test.

[[CO4,CO5,CO6](Remember/LOCQ)]

5 + 7 = 12

Group - D

6. Observe the figure shown below and answer accordingly.



(i) Identify the type of damage/distress shown in the figure.

(ii) Suggest proper repair material that can be utilized for repair and rehabilitation of such damaged structural component.

(iii) Suggest proper repair/retrofitting technique for such damage in the structural component.

[[CO1,CO2,CO3,CO4](Analyse/HOCQ)]

(3 + 4 + 5) = 12

7. (a) Explain the following terms:

(i.) Guniting and Shotcreting

(ii) Stitching process as repair technique.

[[CO3,CO4](Apply/IOCQ)]

(b) Mention various essential parameters recommended for concrete repair materials.

[[CO4](Remember/LOCQ)]

(3 + 4) + 5 = 12

Group - E

8. (a) Explain the different methods of strengthening the concrete structures against earthquake.

[[CO5](Analyse/HOCQ)]

(b) Discuss various retrofitting techniques adopted for deficient foundations.

[[CO6](Apply/IOCQ)]

6 + 6 = 12

9. Explain how strengthening of masonry walls can be carried out with diagram.

[[CO6](Analyse/HOCQ)]

12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38.54	15.63	45.83