6E3037

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B.Tech VI Semester (Main/Back) exam. May, 2012
Civil engineering
6CH6.1 Repair and Rehabilitation of Structure

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five questions,** selecting one question from each unit. All Question carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clerly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. Nil 2. Nil

Unit-I

1 (a) Explain the chloride ingress in concrete and factors on which its likelihood of occurrence depends; its effect and how the ingress can be prevented or minimized? 6

(b) What do you understand by alkali-aggregate reaction? What is its effect on concrete? Explain with the help of figure. How it can be prevented? 6

(c) How abrasion and erosion of concrete may be minimized? 4

Or

1 (a) Explain the mechanism of carbonation of concreete & its effect for initiation of corrosion 4

(b) Explain the pattern and causes of following types of cracks in concrete and their preventive measures:

(i) Plastic shrinkage

(ii) Drying shrinkage

(iii) Crazing cracks 12

Unit-II

2 (a) Explain ultrasonic pulse velocity test for concrete with figures and how the ve-locity values indicate quality of concrete? 5

(b) Discuss penetration resistance and pull out tests for testing of concr -ete with figures. 4+4=8

(c) How the surfaces of the concrete cores indicate quality? Discuss effect of height/diameter of concrete cores and related correction factors to estimate actual strength of concrete. 3

Or

2 (a) How concrete resistivity is used to assess corrosion and its risk. De -scribe its principle, testing method and typical values. Draw figure/s to explain. 6

(b) Discuss the half cell potential method of corrosion assessment & it's typical limiting values. 4

(c) Discuss the factors on which the rebound number reading on concr- ete depends. Discuss the course and method of testing if carbonation or corrosion is suspected in concrete. Also discuss typical impact energy values of rebound hammers generally employed in concrete testing works. 6

Unit-III

3 (a) Write specific functions and advantages of polymers used as a con- crete repair material through polymer modified cementitious system. 4

(b) Discuss properties and selection criterion of epoxy, polyester and acrylicresins. 8

(c) What is FRP? Discuss the relative properties of GFRP and CFRP. 4

Or

3 (a) What do you understand by ferrocement? Discuss its advantages and applications. 4

(b) How bonding aspect of repair materials can be evaluated? Discuss any three methods with reference to standards. Explain with figurers. 9

(c) Discuss repair material selection process and factors to be considered in general for the same in brief. 3

Unit-IV

4 (a) Discuss the materials, advantages and limitations of cement and chemi -cal grouts. 6

(b) Discuss dry-mix and wet-mix process of shotcrete. 8

(c) Write typical gradation limits for combined aggregates used in shotcrete. 2

Or

4 (a) Discuss preparation process for repair in the case of underwater repair. 6

(b) Describe tremie concrete method including its materials. 6

(c) Discuss the method of externally bonded plates, the materials and associated factors involved. 4

Unit-V

5 (a) Define the following ten terms, which are associated with observationsofdistress in concrete structures: craze, cracks, chalking,delmination, pitting, popnt, scaling, spalling, honeycombing, laitance. 10

(b) Discuss case study of rehabilitation of a dam structure including discussion of the problem, evaluation of different options final solution and its performance. May consider any one of the case study of POMONA dam, Kinzua dam or any other dam. 6

Or

5 (a) What inferences can be drawn from the data given below, derived from the chemical properties of concrete powder samples of a distressed building:

PH value

Distance from surface	0-25mm	25-50mm
Column1	8.74	9.15
Column1	8.74	9.20

4

(b) Fill in the blanks/use appropriate word: 1x2

(i) The Ph value of concrete at the time of construction is about_____.

(ii) Higher value of concrete cover is recommended in aggressive environment, so that rate of _____ can be checked.

(c) In evaluation of a concrete structure following observations were recorded:

(i) Major cracks were noticed in the columns where steel plates were embedded.

(ii) Rebound hammer test readings indicated good surface layer of concrete.

(iii) Average UPV value was of the order of 2.50km/sec., however the UPV value of dressed core concrete sample were greater than 3.4 km/sec.

(iv) Compressive strength of core sample found to vary from 17.7 to 22.4 N/mm^2 with design specified concrete as M15

(v) In columns, the PH value at 0-25 mm depth, ranged from 9.2 to 11.30 and at 25-50mm depth the value ranged from 9.7 to 11.10.

vi) The chloride content in concrete sample ranged between 0.75% to 5.5%
by weight of cement.

(vii) The half cell potential values ranged for majority of columns between -250mV and above and these for ranged from -186mV to 356mV.

(viii) The concrete resistivity value for columns ranged from 6.1 to 8.8kW-cm and those in beams, it ranged between 6.0 to 9.5kW-cm.

Based on the above, comment on the likely causes of distress and suggest repair procedure and materials. 10