Techno India NJR Institute of Technology

Lab File

CONCRETE STRUCTURES DESIGN (5CE4-21)

Session 2023-24

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Syllabus

3rd Year- V Semester: B.Tech. (Civil Engineering)

5CE4-21: CONCRETE STRUCTURES DESIGN

Credit: 1.5 Max. Marks: 100(IA:60, ETE:40)

0L+0T+3P End Term Exam: 3 Hours

SN	Contents	Hours
1	Revision of Typical problems of BMD and SFD	**3**
2	Analysis and Design of singly reinforced rectangular beam section for Flexure, based on Working stress design philosophy.	**3**
3	Analysis and Design of singly reinforced rectangular beam section for Flexure, based on Limit State design philosophy.	**3**
4	Analysis and Design of doubly reinforced rectangular beam section For flexure, based on Limit State design philosophy.	**3**
5	Analysis and Design of flanged beam section for flexure, based on Limit State design philosophy.	**3**
6	Problems on Limit state of serviceability for deflection as per codal Provisions of empirical coefficients.	**3**
7	Analysis and design of prismatic sections for shear using LSD	**3**
8	Problems on limit state of collapse in bond	**3**
9	Analysis and design of one way slabs using LSM,	**3**
10	Analysis and design of two way slabs using LSM,	**3**
11	Analysis and design of short axially loaded columns	**3**
12	Analysis and design of footing	**3**
13	Analysis and Design of beams for torsion as per codal method.	**3**
	TOTAL	**39**

Course Overview:

Student will learn basics of "Design of concrete structures" from these 39 hours lab course. The student will able to understand the properties of concrete and steel and the behavior of reinforced concrete as a structural material and also, Students will be able to design of reinforced concrete structural members such as beams, slabs, footings, and columns.

Course Outcomes:

CO.NO.	Cognitive Level	Course Outcome
1	Application	Students will be able to identify the design mix and compute the Characteristic strength of concrete.
2	Comprehension	Students will be able to classify the basic philosophy of Working Stress and Limit State Design of RCC structures.
3	Synthesis	Students will be able to design different structural components like beams, columns, slabs etc.
4	Synthesis	Students will be able to prepare detailed reinforcement diagram of Each component using techniques involved in the course.
5	Application	Students will be able to compute shear, deflection and Development length.

Prerequisites:

1. Students will be able to identify the design mix and compute the characteristic strength of Concrete.
2. Students will be able understand the basic philosophy of Working Stress and Limit State Design of RCC structures.
3. Students will be able to design different structural components like beams, columns, slabs and footing etc.
4. Students will be able to compute shear, deflection and development length. Students will be able to Draw detailed reinforcement diagram of each Component using Techniques involved in the course.

Course Outcome Mapping with Program Outcome:

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO421.1	3	3	3	3	2	2	2	1	1	1	2	3	2	1	1
CO422.2	3	2	2	3	2	1	2	1	1	1	1	1	2	1	1
CO423.3	2	2	2	1	2	2	2	2	1	1	2	1	2	1	1
CO424.4	2	2	2	2	1	1	0	0	0	1	0	0	2	1	1
CO425.5	2	2	2	1	2	2	2	2	1	1	2	1	2	1	1
CO425 (AVG)	2.4	2.2	2.2	2	1.8	1.6	1.6	1.2	0.8	1	1.4	1.2	2	1	1

Course Coverage Module Wise:

Lab No.	Exp. No.	Topic
1	1	Revision of Typical problems of BMD and SFD
2	2	Analysis and Design of singly reinforced rectangular beam section for Flexure, based on Working stress design philosophy.
3	3	Analysis and Design of singly reinforced rectangular beam section for Flexure, based on Limit State design philosophy
4	4	Analysis and Design of doubly reinforced rectangular beam section For flexure, based on Limit State design philosophy
5	5	Analysis and Design of flanged beam section for flexure, based on Limit State design philosophy
6	6	Problems on Limit state of serviceability for deflection as per codal Provisions of empirical coefficients.
7	6	Analysis and design of prismatic sections for shear using LSD
8	8	Problems on limit state of collapse in bond
9	9	Analysis and design of one way slabs using LSM
10	10	Analysis and design of two way slabs using LSM

Assessment Methodology:

1. Practical exam using Advance Surveying Lab software.
2. Internal exams and Viva Conduct.
3. Final Exam (practical paper) at the end of the semester.

TEACHING AND LEARNING RESOURCES UNIT-WISE

1. FUNDAMENTAL CONCEPTS OF DESIGN PHILOSOPHY OF RC MEMBERS

Video Tutorials:

http://www.nptelvideos.com/video.php?id=1648&c=11

http://www.nptelvideos.com/video.php?id=1644&c=11

http://www.nptelvideos.com/video.php?id=1645&c=11

http://www.nptelvideos.com/video.php?id=1640&c=11

Theory concepts:

https://drive.google.com/drive/u/0/folders/1xOW8yP5YXYPbFcWisWAclrf02pfcfgBC

https://drive.google.com/drive/u/0/folders/1qrfuXk48BAs1htlQQ3TsnJ5BNDUsfc3d

Sample Quiz:

https://www.onlineinterviewquestions.com/rcc-structures-design-mcq/

https://drive.google.com/drive/u/0/folders/12mtJqoOmzcPMiLx0b-LF5uP7yibAvDoQ

2. LIMIT STATE DESIGN: LIMIT STATE DESIGN AND SERVICEABILITY

Video Tutorials:

http://www.nptelvideos.com/video.php?id=1641&c=11

http://www.nptelvideos.com/video.php?id=1635&c=11

http://www.nptelvideos.com/video.php?id=1643&c=11

http://www.nptelvideos.com/video.php?id=1642&c=11

http://www.nptelvideos.com/video.php?id=1634&c=11

http://www.nptelvideos.com/video.php?id=1639&c=11

Theory concepts:

https://drive.google.com/drive/u/0/folders/1xOW8yP5YXYPbFcWisWAclrf02pfcfgBC
https://drive.google.com/drive/u/0/folders/1qrfuXk48BAs1htlQQ3TsnJ5BNDUsfc3d

Sample Quiz:

https://edurev.in/course/quiz/attempt/-1_Test-RCC--Concrete-Structures--1-/4146f869-86bb-433f-8751-4f3d06ea7c84

https://teswesm.com/online-test/design-of-concrete-structures-mcqs-set-2/205/20-20

3. SLABS: ANALYSIS AND DESIGN OF ONE WAY USING LSM

Video Tutorials: http://www.nptelvideos.com/video.php?id=1646&c=11

Theory concepts:

https://drive.google.com/drive/u/0/folders/1xOW8yP5YXYPbFcWisWAclrf02pfcfgBC
https://drive.google.com/drive/u/0/folders/1qrfuXk48BAs1htlQQ3TsnJ5BNDUsfc3d

Sample Quiz:

https://www.onlineinterviewquestions.com/rcc-structures-design-mcq/

4. DESIGN OF COLUMNS AND FOOTING AND TORSION:

Video Tutorials:

http://www.nptelvideos.com/video.php?id=1637&c=11

http://www.nptelvideos.com/video.php?id=1636&c=11

http://www.nptelvideos.com/video.php?id=1622&c=11

Theory concepts:

https://drive.google.com/drive/u/0/folders/1xOW8yP5YXYPbFcWisWAclrf02pfcfgBC
https://drive.google.com/drive/u/0/folders/1qrfuXk48BAs1htlQQ3TsnJ5BNDUsfc3d

Sample Quiz:

https://www.examveda.com/civil-engineering/practice-mcq-question-on-rcc-structuresdesign/
https://expertmcqs.com/rcc-structures-design-mcq-test-online-quiz/

ASSIGNMENT -1

1) Under Reinforced and over reinforced section as per Limit State Method.
2) Why the doubly reinforced beams are preferred than singly reinforced beams?
3) Characteristic Strength of concrete and partial safety factor as per IS 456:2000.
4) Why do the IS code suggest to provide minimum reinforcement in beam if it is not required theoretically?
5) Explain the Design methods of RCC with Relatives merits and de-merits.
6) Explain the Limit state of serviceability for deflection and Bond
7) Design doubly reinforced rectangular beam 300 mm x 600 mm over an effective span of 5m. The superimposed load on the beam in 50 kN/m. Effective cover is 50 mm. Take Fe415 and M25.
8) Explain the following

    1. Restrained Slab
    2. Unrestrained Slab

ASSIGNMENT -2

1. What is one way slab? Explain the deflection control for slab.
2. Explain the difference between one way and two-way slab.
3. What is the classification of columns?
4. Define the effective length of column. Explain the slenderness ratio.
5. What is the minimum loaded column in LMS. eccentricity? Give its limiting value for a axially
6. Design a simply supported slab for a room 3.5mx7.5m clear in size. The slab is carrying an imposed load of 5 kN/m2. Use M20 concrete and Fe 415 Steel
7. Find the ultimate load carrying capacity and allowable load for a short column of size 500mm x 500mm. The column is reinforced with 4-25 mm diameter bars. Use M20 concrete and Fe 415 Steel. Assume emin < 0.05 D.
8. Design a square footing of a uniform thickness for an axially loaded column of 450x450 mm size. The safe bearing capacity of soil is 190 kN/m2. Load on column is 850 KN. Use M20 and Fe 415 steel.
9. Design a circular column of diameter 400mm subjected to a load of 1200 kN. The column is having spiral ties. The column is 3.5 m long and effectively held in position at both ends but not restrained against rotation. Use M20 concrete and Fe 415 Steel.

ASSIGNMENT -3

1. Describe various steps in design of an axially loaded column as per IS code.
2. Describe various steps in design of a square footing with uniform depth supporting a column with axial load only.
3. Explain the Limit state of collapse: Compression and provisions of longitudinal reinforcement in column as per IS 450:2000.
4. Explain the Restrained slabs and unrestrained slab, and write its importance.

OBJECTIVE QUESTIONS

1. In a reinforced concrete retaining wall, a shear key is provided, if the

(A) Retaining wall is not safe against overturning

(B) Retaining wall is not safe against sliding

(C) Shear force in the toe slab is more than that in the heel slab

(D) Shear stress in the vertical stream is excessive

2. Which of the following has high tensile strength?

(A) Cold drawn wires

(B) Thermo mechanically treated bars

(C) Plain hot rolled wires

(D) Mild steel

3. In a R.C. beam main reinforcement consists of 16 mm bars and coarse aggregate size used in 20 mm. The horizontal distance between two parallel reinforcing bars should not be less than

(A) 20 mm

(B) 25 mm

(C) 27 mm

(D) 30 mm

4. In a R.C. beam shear reinforcement should be always in the form of

(A) Bent up bars with stirrups

(B) Verticalstirrups

(C) Inclined stirrups

(D) Any one of the above

5. Characteristic strength is

(A) Mean strength + 1.64 times standard deviation

(B) Mean strength

(C) Minimum assured strength

(D) Minimum assured strength + 1.64 times standard deviation

6. In the working stress method of R.C.C. design which one of the following is correct?

(A) The modular ratio between steel and concrete remains constant

(B) Shear deformations are neglected

(C) Stress strain relation is linear, both for steel and concrete

(D) All the above

7. M 75 concrete is regarded as

(A) Ordinary concrete

(B) Ultra high strength concrete

(C) Standard concrete

(D) High strength concrete

8. Snow load need not be considered in the design of structures in cold regions, if slope of the root is more than

(A) 25°

(B) 35°

(C) 60°

(D) 65°

9. If Fe 415 steel bars are used as tensile reinforcement, minimum percentage of steel to be used is

(A) 0.2

(B) 0.25

(C) 0.205

(D) 0.30

10. Spacing of longitudinal bars measured along the periphery of R.C. column shall not exceed

(A) 200 mm

(B) 300 mm

(C) 400 mm

(D) 500 mm

11. The depth of footing required for an isolated column depends upon

(A) Single shear

(B) Double shear

(C) Bending moment

(D) All the three above

12. High carbon content in the steel causes

(A) Increase in tensile strength but decrease in ductility

(B) Decrease in tensile strength but increase in ductility

(C) Increase in tensile strength and ductility

(D) Decrease in both tensile strength and ductility

13. In the working stress method of R.C.C. design factor of safety used for concrete and steel are respectively

(A) 3 and 1.5

(B) 3 and 1.85

(C) 4 and 2

(D) 4 and 1.85

14. The maximum spacing of vertical shear reinforcement for a beam of size 250 x 360 mm is

(A) 250 mm

(B) 260 mm

(C) 270 mm

(D) 300 mm

15. Characteristic load means

(A) Mean load + 5% of standard deviation

(B) Mean load + 10% of standard deviation

(C) Maximum load

(D) Mean load

16. IS 456-2000 recommends that the unsupported length of any column should not exceed _____ times the least lateral dimension of the column.

(A) 20

(B) 40

(C) 60

(D) 70

17. The depth of footing required for an isolated column depends upon

(A) Single shear

(B) Double shear

(C) Bending moment

(D) All the three above