Techno India NJR Institute of Technology

(Approved by AICTE, New Delhi and Affiliated to Rajasthan Technical University Kota (Raj.))

Course File

Subject Title/Subject Code: Design of Concrete Structures

5CE4-03

Semester: V Year: III

Name of the Faculty: Mr. Rakesh Yadav

E-mail id: rakesh.yadav@technonjr.org

Class Schedule

Total Number of Lectures: 40

i) Course Objective

The course aims to equip students with fundamental knowledge and skills in the design of reinforced concrete (RC) structures, adhering to relevant Indian Standards (IS) codes. Students will learn various design methodologies, including the Working Stress Method and Limit State Design (LSM), to analyze and design beams, slabs, columns, and footings. Emphasis is placed on understanding structural behavior, reinforcement detailing, serviceability limits, and the concepts of shear, torsion, bond stress, and deflection control, preparing students to tackle practical challenges in RC design and construction**.**

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INDEX - COURSE FILE

S. No.	CONTENT / ITEM NO.	PAGE NO.	STATUS
1	Vision And Mission Of The Institute		
2	Vision And Mission Of The Department		
3	Program Educational Objective Of Department (PEO's)		
4	Program Outcomes Of Department (PO's)		
5	Course Outcome (COs)		
6	COs mapping with Pos and PSOs		
7	Academic Calendar		
8	Evaluation Scheme		
9	Course Syllabus		
10	Prescribed Books		
11	Copy Of Time Table		
12	Course Schedule Plan		
13	Assignment Sheet (Unit Wise)		
14	Quiz Questions (One From Each Unit)		
15	Question Papers Of Mid Term Exam-I		
16	Marks and Gap Analysis in Mid Term I		
17	Remedial Action Taken To Remove the Gaps after mid Term I		
18	Question Papers Of Mid Term Exam-II		
19	Gap Analysis in Mid Term II		
20	Remedial Action Taken To Remove the Gaps after mid Term II		
21	Model Question Paper With Key Solution		
22	University Question Paper (Last one year)		
23	Student Performance Report		
24	Result Analysis		

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VISSION & MISSION OF INSTITUTE

Vision

Empowering student with recent and emerging technologies to create innovative technical leaders capable of contributing to industrial and societal needs for betterment of mankind across the globe.

Mission

M1: To provide dynamic learning environment to students by providing constant exposure to latest technologies by linking closely with the industries.

M2: To establish effective interface with industry to obtain live problems to enhance critical thinking and problem-solving skills among students and consultancy projects for faculty.

M3: To provide avenues and opportunities to faculty for domain specific trainings and qualification upgradation.

M4: To develop ethical leaders with strong communication skills.

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VISION & MISSION OF DEPARTMENT

Department Vision

To increase students learning of fundamentals for designing and planning of buildings and latest technologies through industry-aligned project-based learning which will help in transforming students to be good civil engineering professionals leading to innovation and incubation of new ideas.

Department Mission

M1: To create experimental learning through solving problems of Government, Society, Smart Cities, Industry and other entities.

M2: To teach the latest technologies to the students as beyond the syllabus activity so that they are updated and industry ready.

M3: To enable engineering students, understand industry-aligned technologies and learn to find solutions from their early engineering days and this is the only way to produce globally relevant engineers solving real-life problems applying current technologies.

M4: To enable students to generate projects through problem faced by and requirement of Smart cities, industry, Government and other entities whereby those outlined problem statements are to be studied deeply by a group of faculty members to convert them into real-time project format.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs 1: To provide an in-depth understanding of the fundamentals of Civil Engineering and create a foundation for lifelong learning to facilitate a progressive career in the construction Industry, as an entrepreneur and in pursuit of higher studies.

PEOs 2: To equip the students with technical and analytical skills to develop innovative solutions to complex real-life problems using existing and novel technologies. To equip the students with good communication and interpersonal skills, inter-disciplinary teamwork and leadership skills to enable them to fulfill professional responsibilities.

PEOs 3: To expose them to various contemporary issues which will enable them to become ethical and responsible towards themselves, co-workers, Society and the Nation.

PEOs 4: To make the student's industry ready by imparting education related to the latest technologies so that they can grab future industry jobs.

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PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: To be aware of and initiate some-work on future technologies and new developments which may impact the future Industry 4.0.

PSO2: Hands on training on upcoming technologies and project-based learning.

PSO3: Get exposure to BIM (Building Information Modeling).

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PROGRAMME OUTCOMES (POs)

A student will develop:

PO01. ENGINEERING KNOWLEDGE: An ability to apply knowledge of Mathematics, Science and Engineering Fundamentals in Electronics and Communication Engineering.

PO02. PROBLEM ANALYSIS: Ability to analyze and interpret data by designing and conducting experiments. Develop the knowledge of developing algorithms, designing, implementation and testing applications in electronics and communication related areas.

PO03. DESIGN/ DEVELOPMENT OF SOLUTION: An ability to Design a system Component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

PO04. CONDUCTION OF INVESTIGATION OF COMPLEX PROBLEMS: Ability to Identify, formulate and solve engineering problems.

PO05. MODERN TOOL USAGE: An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

PO06. THE ENGINEERING AND SOCIETY: Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.

PO07. ENVIRONMENT & SUSTAINABILITY: Understand the impact of professional engineering solution in societal and environmental contexts, and demonstrate the knowledge of, and need of sustainable development.

PO08. ETHICS: An ability to understand the professional, social and ethical responsibility.

PO09. INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. COMMUNICATION: An ability to Communicate effectively in order to succeed in their profession such as, being able to write effective reports and design documentation, make effective presentations.

PO11. PROJECT MANAGEMENT & FINANCE: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in team, to manage projects and in multidisciplinary environment.

PO12. LIFE-LONG LEARNING: Recognize the need and an ability to engage in life-long learning.

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COURSE OUTCOMES (COs) OF THE SUBJECT

CO No.	Mapping	Statement
CO35403.1	**Remembering**	Recall fundamental concepts, design principles, and relevant IS codes associated with reinforced concrete (RC) structures..
CO35403.2	**Understanding**	Understand the role of different types of reinforcement, design assumptions, and the principles of Working Stress Method and Limit State Design (LSM)..
CO35403.3	**Applying**	Apply LSM principles to design RC beams, slabs, and columns for various structural conditions..
CO35403.4	**Analyzing**	Apply LSM principles to design RC beams, slabs, and columns for various structural conditions..
CO35403.5	**Evaluating**	Evaluate the structural performance of RC members, ensuring safety, stability, and adherence to design standards.

COS MAPPING WITH POs AND PSOs

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO35403.1	3	3	3	3	0	0	0	1	1	0	0	1	2	1	1
CO35403.2	3	2	2	3	0	0	0	1	1	0	0	1	2	1	1
CO35403.3	2	2	2	1	0	0	0	2	1	0	0	1	2	1	1
CO35403.4	2	2	2	2	0	0	0	0	0	0	0	1	2	1	1
CO35403.5	2	2	2	1	0	0	0	2	1	0	0	1	2	1	1
CO35403 (AVG)	2.4	2.2	2.2	2	0	0	0	1.2	0.8	0	0	1	2	1	1

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UNIVERSITY ACADEMIC CALENDAR

Academic Calendar for odd Semester for Session

RAJASTHAN TECHNICAL UNIVERSITY KOTA

Course: Bachelor of Technology (B.TECH.) for Odd Semester

Semester	I	III	V	VII
Induction Program	17.08.2023			
Commencement of Classes	11.09.2023	24.08.2023	04.09.2023	04.09.2023
Commencement of First Mid Term	02.11.2023	03.10.2023	05.10.2023	05.10.2023
Commencement of Second Mid Term	07.12.2023	16.11.2023	20.11.2023	20.11.2023
Last Working Day	23.12.2023	02.12.2023	02.12.2023	30.11.2023
Commencement of Practical Exams	02.01.2024	04.12.2023	23.12.2023	14.12.2023
Commencement of Theory Exams	18.01.2024	14.12.2023	08.12.2023	07.12.2023
Winter Break				

Academic Calendar of Institute

Academic Calendar for odd semester for session 2023-24

Academic Calendar Odd Semester 2022-23				
Particulars	**B.Tech-I**	**B.Tech- III**	**B.Tech- V**	**B.Tech- VII**
Commencement of classes	09-11-2022	08-08-2022	19-09-2022	17-08-2022
Last Working Day	25-02-2023	24-12-2022	07-01-2023	03-12-2022
Course Progression Report-I	10-12-2023	22-09-2022	01-11-2022	17-09-2022
First Mid Term Exam	15-12-2022	29-09-2022	07-11-2022	22-09-2022
Remedial Class-I	26-12-2022	10-10-2022	17-11-2022	06-10-2022
Course Progression Report-II	04-02-2023	26-11-2022	17-12-2022	11-11-2022
Second Mid Term Exam	09-02-2023	01-12-2022	22-12-2022	16-11-2022
Remedial Class-II	20-02-2023	10-12-2023	05-01-2023	25-11-2022
Commencement of Theory Exam	16-03-2023	17-01-2023	18-01-2023	07-12-2022
Commencement of Practical Exam	27-02-2023	03-01-2023	30-01-2023	12-12-2022

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Evaluation Scheme

FACULTY DETAILS:

Name of the Faculty : Rakesh Yadav

Designation :Assistant Proffesor

Department : Civil Engineering

1. TARGET

a) Percentage Pass: 100%
b) Percentage I class: 60 %

2. METHOD OF EVALUATION

- [x] Continuous Assessment Examinations (Mid-Term 1, Mid-Term 2)
- [x] Assignments / Seminars
- [ ] Mini Projects
- [x] Quiz
- [x] Semester Examination

Others_____

3. List out any new topic(s) or any innovation you would like to introduce in teaching the subject in this Semester.
4. Take the help of creative tools to stimulate creativity. Include slide presentations, demonstration or forms of visual exercises that will excite the young minds and capture their interest.

Signature of Faculty: **Signature of HOD**

UNIVERSITY SYLLABUS

RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

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

5CE4-03: DESIGN OF CONCRETE STRUCTURES

Credit: 3 **Max. Marks: 100(IA:30, ETE:70)**

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

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Fundamental concepts of design of RC members, assumptions. Types and function of reinforcement. Introduction to various related IS codes, Characteristic load and characteristic strength. **Working Stress Method:** Working stress design philosophy. Analysis and Design of singly reinforced rectangular beam section for flexure.	5
3	**Limit State Design:** Limit state design philosophy. Assumptions, Analysis and design of singly reinforced, doubly reinforced rectangular beams and flanged beams for flexure using codal provisions for simply supported, cantilever, fixed and continuous beams.	10
4	**Limit state of serviceability for deflection**: control of deflection as per codal provisions of empirical coefficients. **Limit state of collapse in shear**: Types of shear reinforcement and its detailing, analysis and design of shear reinforcement for prismatic sections. **Limit state of collapse in bond**: concept of bond stress, anchorage length and development length. Detailing and curtailment of reinforcement as per codal provisions.	6
5	**Slabs:** Analysis and design of one way and two way slabs using LSM, Detailing of reinforcement. Check for shear and deflection.	6
6	**Columns:** Short and long columns, their structural behaviour. Analysis and design of axially loaded short columns, using LSM. Analysis of eccentrically loaded short columns. Introduction to Pu-Mu interaction curves and their use for eccentrically loaded columns. **Footings:** Analysis and design of Isolated column footing for axial load. Introduction to combined footing for two columns (without central beam) for axial loads using LSM.	5 4
7	**Torsion:** Analysis and Design of beams for torsion as per codal method.	3
	TOTAL	40

Office of Dean Academic Affairs
Rajasthan Technical University, Kota

PRESCRIBED BOOKS

1. Reinforced Concrete: Limit state design by A.K. Jain, Nemchand and Brothers.
2. Limit state design by Dayaratnam, Oxford and IBH Publishing House
3. Limit State Design of Reinforced Concrete by Verghese P.C., PHI Delhi
4. Reinforced Cement Concrete Design by Neelam Sharma, S.K. Kataria & Sons

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WEEKLY TIME TABLE OF THE TEACHER

Day	1	2	3	4	5	6	7
Monday				DCS (RY)			
Tuesday				DCS (RY)			
Wednesday				DCS (RY)			
Thursday				DCS (RY)			
Friday			DCS (RY)				
Saturday							

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COURSE-PLAN

Lecture No.	UNIT.	TOPICS	Teaching Methods/ Teaching Aids
1	1	**INTRODUCTION:** Objective, scope and outcome of the course	White Board
2	2	**FUNDAMENTAL CONCEPTS OF DESIGN OF RC MEMBERS**,	White Board
3	2	Types and function of reinforcement. Introduction to various related IS codes,	White Board
4	2	Characteristic load and characteristic strength	White Board
5	2	Working Stress Method: Working stress design philosophy	
6	2	Design of singly reinforced rectangular beam section for flexure	White Board
7	3	**LIMIT STATE DESIGN: LIMIT STATE** Students will able to identify design philosophy and Assumptions	White Board
8	3	Students will able to design of singly reinforced	White Board
9	3	Students will able to design of singly reinforced	White Board
10	3	Students will able to design of singly reinforced	White Board
11	3	Students will able to Doubly reinforced rectangular beams and flanged beams for flexure using codal provisions for simply supported	White Board
12	3	Students will able to design of doubly reinforced rectangular beams and flanged beams for flexure using codal provisions for simply supported.	White Board
13	3	Students will able to design of doubly reinforced rectangular beams and flanged beams for flexure using codal provisions for simply supported	White Board
14	3	Students will able to design of cantilever, fixed and continuous beams	White Board
15	3	Students will able to design of cantilever, fixed and continuous beams	White Board
16	3	Students will able to design of cantilever, fixed and continuous beams	White Board
17	4	**LIMIT STATE OF SERVICEABILITY FOR DEFLECTION**: Students will able to compute control of deflection as per codal provisions of empirical coefficients	White Board

18	4	Students will able to understand Limit state of serviceability for deflection: and compute control of deflection as per codal provisions of empirical coefficients	White Board
19	4	Students will able to understand Limit state of collapse in shear and write the types of shear reinforcement and its detailing	White Board
20	4	Students will able to design of shear reinforcement for prismatic sections	White Board
21	4	Students will able to understand Limit state of collapse in bond, concept of bond stress, anchorage and development length	White Board
22	4	Students will able to draw Detailing and identify curtailment of reinforcement as per codal provisions	White Board
23	5	**SLABS: ANALYSIS AND DESIGN OF ONE WAY USING LSM**	White Board
24	5	Students will able to design of one way using LSM	White Board
25	5	Students will able to design two-way slabs using LSM	White Board
26	5	Students will able to two-way slabs using LSM	White Board
27	5	Students will able to draw detailing of reinforcement	White Board
28	5	Students will able to compute for shear and deflection	White Board
29	6	**COLUMNS:** Students will able to understand short and long columns, their structural behaviour	White Board
30	6	Students will able to design of axially loaded short columns using LSM	White Board
31	6	Students will able to understand design of axially loaded short columns using LSM	White Board
32	6	Students will able to analyze of eccentrically loaded short columns	White Board
33	6	Students will able to understand concept of Pu-Mu interaction curves and their use for eccentrically loaded columns	White Board
34	6	Students will able to design of Isolated column footing for axial load	White Board
35	6	Students will able to design of Isolated column footing for axial load	White Board
36	6	Students will able to identify combined footing for two columns (without central beam) for axial loads using LSM	White Board

37	6	Students will able to identify combined footing for two columns (without central beam) for axial loads using LSM	White Board
38	7	**TORSION:** Students will able to understand the torsional behaviour of beams in frame structures.	White Board
39	7	Students will able to Design of beams for torsion as per codal method	White Board
40	7	Students will able to Design of beams for torsion as per codal method	White Board

Signature of Faculty: **Signature of HOD**

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Assignment – 1

B. TECH 3rd – YEAR (V SEM.)

Subject: - Design of Concrete Structures

i) List the key assumptions made in the design of RC members using the Limit State Design (LSM) method. How do these assumptions differ from those used in the Working Stress Method (WSM)?

ii) What are the types and functions of different types of reinforcement used in RC structures? Provide examples.

iii) Explain the significance of characteristic load and characteristic strength in the design of RC structures as per IS codes. Why are these parameters critical in design?

iv) Describe the differences between singly reinforced and doubly reinforced beams. Under what conditions is it necessary to use doubly reinforced beams?

v) Using the Working Stress Method (WSM), design a singly reinforced rectangular beam section subjected to a given moment. Assume the required dimensions and loading conditions.

vi) Design a one-way slab using the Limit State Design (LSM) method, considering a simply supported span. Include details of the reinforcement as per IS code provisions.

vii) Analyze a cantilever beam with a rectangular section for shear forces. Determine the required shear reinforcement using LSM for a given loading condition.

viii) Compare the structural behavior of short and long columns. What factors influence the choice of design approach for these columns?

ix) Evaluate the adequacy of the provided reinforcement details for a two-way slab, considering factors such as deflection, shear, and anchorage length.

x) Critically analyze the impact of torsion on beam design. Design a beam for a given torsional moment and justify the choice of torsional reinforcement according to codal provisions.

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Assignment – 2

B. TECH 3rd – YEAR (V SEM.)

Subject: - Design of Concrete Structures

i) A rectangular RC beam section has a width of 300 mm and an effective depth of 500 mm. It is reinforced with steel of characteristic strength fy=415 MPaf_y = 415 \, \text{MPa}fy=415MPa. Calculate the moment of resistance for a singly reinforced beam if the area of steel AsA_sAs is 1500 mm21500 \, \text{mm}^21500mm2. Use the Limit State Design method and assume fck=25 MPaf_{ck} = 25 \, \text{MPa}fck =25MPa.

ii) Design a simply supported one-way slab spanning 4 m, subjected to a live load of 3 kN/m23 \, \text{kN/m}^23kN/m2 and a floor finish load of 1 kN/m21 \, \text{kN/m}^21kN/m2. Use M20 grade concrete and Fe415 steel. Calculate the required thickness and reinforcement for the slab using the LSM method.

iii) A short RC column with a square cross-section of 400 mm x 400 mm is subjected to an axial load of 1000 kN. Design the column using M25 grade concrete and Fe415 steel. Determine the required area of longitudinal reinforcement.

iv) A cantilever beam of span 2.5 m is subjected to a uniformly distributed load of 10 kN/m10 \, \text{kN/m}10kN/m along its length. Design the shear reinforcement using LSM, considering a beam cross-section of 300 mm x 450 mm, M25 grade concrete, and Fe415 steel. Determine the required spacing of stirrups.

v) A T-beam has a flange width of 1200 mm, a flange thickness of 100 mm, and a web width of 300 mm. The effective depth is 600 mm. Determine the ultimate moment of resistance for the T-beam if it is reinforced with 2500 mm22500 \, \text{mm}^22500mm2 of tensile reinforcement using M30 grade concrete and Fe415 steel

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SAMPLE QUIZ QUESTIONS

1. Which of the following is NOT an assumption made in the analysis of RC beams using the Limit State Design method?

A) Plane sections remain plane before and after bending.

B) Tensile strength of concrete is considered in flexural design.

C) The strain in steel and concrete is proportional to their distance from the neutral axis.

D) Maximum strain in concrete at the extreme fiber in bending is 0.0035.

Answer: B) Tensile strength of concrete is considered in flexural design.

2. What is the primary purpose of stirrups in reinforced concrete beams?

A) To resist bending moments

B) To prevent thermal expansion

C) To resist shear forces

D) To increase the ductility of concrete

Answer: C) To resist shear forces

3. In a simply supported one-way slab, which direction is the main reinforcement provided?

A) Along the shorter span

B) Along the longer span

C) Along both spans equally

D) Diagonally

Answer: B) Along the longer span

4. According to IS 456, the minimum cover to the reinforcement for a beam exposed to moderate environmental conditions is:

A) 15 mm

B) 20 mm

C) 25 mm

D) 30 mm

Answer: B) 20 mm

5. For a short column subjected to axial compression, the failure is governed by:

A) Buckling of the column

B) Shear failure

C) Crushing of concrete

D) Yielding of steel

Answer: C) Crushing of concrete

6. What is the development length for a steel bar in tension, according to IS 456:2000, if the characteristic strength of concrete is $f_{ck} = 20 \, \text{MPa}$ and the yield strength of steel is $f_y = 415 \, \text{MPa}$?

A) 47 ϕ

B) 57 ϕ

C) 64 ϕ

D) 70 ϕ

Answer: B) 57 ϕ

7. Which of the following types of beams is most suitable for a situation where high torsional resistance is required?

A) Singly reinforced rectangular beam

B) Doubly reinforced beam

C) Flanged beam (T-beam or L-beam)

D) Box beam

Answer: D) Box beam

8. The characteristic strength of M25 grade concrete is:

A) 25 MPa at 7 days

B) 25 MPa at 28 days

C) 25 N/mm\(^2\) at 7 days

D) 25 N/cm\(^2\) at 28 days

Answer: B) 25 MPa at 28 days

9. For a beam to be classified as doubly reinforced, it must have:

A) Reinforcement only in the tension zone

B) Reinforcement only in the compression zone

C) Reinforcement in both tension and compression zones

D) Shear reinforcement in the form of stirrups

Answer: C) Reinforcement in both tension and compression zones

10. Which of the following methods is primarily used to control deflection in RC beams?

A) Increasing the grade of steel

B) Increasing the depth of the beam

C) Providing additional stirrups

D) Using high strength concrete

Answer: B) Increasing the depth of the beam

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Mid Term 1

TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR

B. TECH 3rd – YEAR (V SEM.) – MT-I

Design of Concrete Structures (**5CE4-03**)

Time: 2 Hr Max. Marks: 70

Note

1) The paper is divided into 2 parts: Part-A and, Part-B
2) Part-A contains 10 questions and carries 2 mark each.
3) Part-B contains 5 questions. Each question is having two options and carries 10 marks each.
4) IS 456:2000 is allowed.

Part- A (20 Marks)

A	Under Reinforced and over reinforced section as per Limit State Method.	CO1
B	Why the doubly reinforced beams are preferred than singly reinforced beams?	CO1
C	Characteristic Strength of concrete and partial safety factor as per IS 456:2000.	CO1
D	Why do the IS code suggest to provide minimum reinforcement in beam if it is not required theoretically?	CO1
E	Give the stress block parameters used in LMS along with the stress diagram.	CO2
F	Define Diagonal tension.	CO2
G	Define bond stress.	CO2
H	What is necessity of providing shear reinforcement?	CO2
I	Difference between one way and two-way slab.	CO3
J	What do mean by the deflection control for slab.	CO3

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Part- B (50 Marks)

1	An Isolated simply supported T-beam has a flange width (b) = 2400mm, Flange thickness (D_f) =120 mm, Effective span (L) =3.6 m. The effective depth of beam (d) = 580 mm and its width (b_w) =300 mm. It is reinforced with 8 bars of 20 mm diameter. Determine the moment of resistance of the section. Use M20 & Fe 415.	CO1
2	Draw the stress block parameters for a typical T-Beam section having $\mathbf{X_u < D_f}$, $\mathbf{X_u > D_f}$ and $\mathbf{X_{umax} > X_u > D_f}$, Also give the formula to determine ultimate moment of resistance for each condition.	CO1
3	With the help of neat sketch, Explain the followings, b) Two Legged Vertical Stirrups c) Inclined Shear Stirrups	CO2
4	Explain the Limit state of serviceability for deflection and Bond	CO2
5	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	CO3

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Marks and Gap Analysis of Mid-Term I

S.No.	University Roll No.	Name of Student	Mid-Term 1 MM-70	Remark (Remedial Class need or not – Y/N)
1.	21ETCCE001	Dev vaishnav	45	
2.	21ETCCE002	Hitesh Sutradhar	45	
3.	21ETCCE004	Naved khan	47	
4.	21ETCCE006	Pushpendra gehlot	52	
5.	21ETCCE007	Shalin Dak	45	
6.	21ETCCE009	Tamanna kumawat	65	
7.	21ETCCE300	Muniraj Sharma	61	
8.	22ETCCE200	Moiz Udaipurwala	54	
9.	22ETCCE201	Vikas Suthar	63	

(Y, if obtained marks are <50%)

Signature of Faculty: **Signature of HOD**

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Remedial Action Taken to Remove the Gaps (After Mid-Term 1)

S.no.	University Roll no.	Name of Student	Topics to be discussed in Remedial Class	Schedule Date of Remedial Class	Outcome Achieved
1.	NIL				
2.					

Signature of Faculty: **Signature of HOD**

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Mid Term Paper-II

TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR

B. TECH 3rd – YEAR (V SEM.) – MT-II

Design of Concrete Structures (**5CE4-03**)

Time: 2 Hr Max. Marks: 70

Note:

1) The paper is divided into 2 parts: Part-A and, Part-B

2) Part-A contains 10 questions and carries 2 mark each.

3) Part-B contains 5 questions. Each question is having two options and carries 10 marks each.

Part- A (20 Marks)

A. What is one way slab? Explain the deflection control for slab.	CO3
B. Explain the difference between one way and two-way slab.	CO3
C. What is the classification of columns?	CO4
D. Define the effective length of column. Explain the slenderness ratio.	CO4
E. What is the minimum eccentricity? Give its limiting value for a axially loaded column in LMS.	CO4
F. Write a brief note on Interaction curves.	CO4
G. Write the purposes to provide RC footings.	CO5
H. Where do we use combined footings, why?	CO5
I. What do you understand by term “equivalent shear force” and “equivalent bending moment”?	CO5
J. Write steps for designing aa beam subjected to tortional moment.	CO5

Part- B (50 Marks)

1. 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	CO3
OR	
1. Explain the Restrained slabs and Unrestrained slab, and write its importance.	CO3

2. 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 e_{min} < 0.05 D.**	CO4
OR	
2 Explain the Limit state of collapse: Compression and provisions of longitudinal reinforcement in column as per IS 450:2000.	CO4

3. 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.	CO4
OR	
3 Describe various steps in design of an axially loaded column as per IS code.	CO4

4 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.	CO5
OR	
4 Describe various steps in design of a square footing with uniform depth supporting a column with axial load only.	CO5

5 Design the torsional reinforcement in a beam of size 400x750mm subjected to a ultimate bending moment, Shear force and twisting moment as 200 kNm, 120 KN and 150 kNm respectively. Use M20 concrete and Fe415 steel	CO5

	OR	
5	Determine the reinforcement required for a beam of size 300x600mm subjected to a factored bending moment, Shear force and torsional moment as 150 kNm, 100 KN and 50 kNm respectively. Use M20 concrete and Fe415 steel	CO5

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Marks and Gap Analysis of Mid-Term II

S.No.	University Roll No.	Name of Student	Mid-Term 1 MM-70	Remark (Remedial Class need or not – Y/N)
1.	21ETCCE001	Dev vaishnav	44	N
2.	21ETCCE002	Hitesh Sutradhar	44	N
3.	21ETCCE004	Naved khan	46	N
4.	21ETCCE006	Pushpendra gehlot	51	N
5.	21ETCCE007	Shalin Dak	44	N
6.	21ETCCE009	Tamanna kumawat	64	N
7.	21ETCCE300	Muniraj Sharma	60	N
8.	22ETCCE200	Moiz Udaipurwala	53	N
9.	22ETCCE201	Vikas Suthar	62	N

(Y, if obtained marks are <50%)

Signature of Faculty: **Signature of HOD**

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Remedial Action Taken to Remove the Gaps (After Mid- Term 1I)

S.no.	University Roll no.	Name of Student	Topics to be discussed in Remedial Class	Schedule Date of Remedial Class	Outcome Achieved
1.	NIL				
2.					

Signature of Faculty: **Signature of HOD**

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Model Question Paper

5E1343

Roll No. _____ Total No. of Pages : 2

5E1343

B.Tech. V - Semester (Main) Examination, Nov. - 2019

PCC/PEC Civil Engineering

5CE4-03 Design of Concrete Structures

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

*Attempt **all ten** questions from **Part A**, selecting **five** questions out of **Seven** from **Part B** and **Four** questions out of **Five** from **Part C**. (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 clearly.*

Use of following supporting material is permitted during examination.(mentioned in form no.205)

1. IS 456:2000

PART - A

(Answer should be given up to **25** words only)

All questions are **compulsory** **(10×2=20)**

1. Write any two difference between limit state and working state methods.
2. What do you understand by torsion of the beam?
3. What do you understand by singly reinforced beam?
4. Write the concept of bond stress.
5. What is anchorage length and development length?
6. Explain difference between design load and working load.
7. Write any two difference between short column and long column.
8. Define one way and two way slab.
9. Define factor of safety.
10. Write any two difference between combined and isolated footing.

PART - B

(Analytical/Problem solving questions)

Attempt any **five** questions **(5×8=40)**

1. A rectangular singly R.C beam with cross - section 320 mm×550 mm is simply supported over the clear span of 4.50 m with support of 250 mm each. Calculate ultimate moment of resistance of the beam using limit state method. Use M20 Fe 415 steel grade.

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STUDENT PERFORMANCE REPORT

Roll No.	Name of Student	I Mid-Term	II Mid-Term	Average
21ETCCE001	Dev vaishnav	45	44	44.5
21ETCCE002	Hitesh Sutradhar	45	44	44.5
21ETCCE004	Naved khan	47	46	46.5
21ETCCE006	Pushpendra gehlot	52	51	51.5
21ETCCE007	Shalin Dak	45	44	44.5
21ETCCE009	Tamanna kumawat	65	64	64.5
21ETCCE300	Muniraj Sharma	61	60	60.5
22ETCCE200	Moiz Udaipurwala	54	53	53.5
22ETCCE201	Vikas Suthar	63	62	62.5

Signature of Faculty: **Signature of HOD**

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RESULT ANALYSIS

S.NO.	RTU ROLL NUMBER	NAME OF STUDENT	END TERM MARKS	SESSIONAL MARKS	TOTAL
		MAX MARKS	**70**	**30**	**100**
1.	21ETCCE001	Dev vaishnav	33	20	53
2.	21ETCCE002	Hitesh Sutradhar	24	20	44
3.	21ETCCE004	Naved khan	17	21	38
4.	21ETCCE006	Pushpendra gehlot	AB	23	AB
5.	21ETCCE007	Shalin Dak	28	20	48
6.	21ETCCE009	Tamanna kumawat	29	29	58
7.	21ETCCE300	Muniraj Sharma	38	27	65
8.	22ETCCE200	Moiz Udaipurwala	38	24	62
9.	22ETCCE201	Vikas Suthar	28	28	56

TOTAL	PASS	FAIL	ABSENT	PASS %
9	9	1	1	88.89%

Indirect Assessment:

Overall Teacher Self-Assessment (at the completion of course) in terms of course objective and outcomes

Course Objectives:

The course aims to equip students with fundamental knowledge and skills in the design of reinforced concrete (RC) structures, adhering to relevant Indian Standards (IS) codes. Students will learn various design methodologies, including the Working Stress Method and Limit State Design (LSM), to analyze and design beams, slabs, columns, and footings. Emphasis is placed on understanding structural behavior, reinforcement detailing, serviceability limits, and the concepts of shear, torsion, bond stress, and deflection control, preparing students to tackle practical challenges in RC design and construction**.**

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Course Outcomes:

At the end of this course students will be able to:

CO1: Recall fundamental concepts, design principles, and relevant IS codes associated with reinforced concrete (RC) structures..

CO2: Understand the role of different types of reinforcement, design assumptions, and the principles of Working Stress Method and Limit State Design (LSM).

CO3: Apply LSM principles to design RC beams, slabs, and columns for various structural conditions.

CO4: Apply LSM principles to design RC beams, slabs, and columns for various structural conditions..

CO5: Evaluate the structural performance of RC members, ensuring safety, stability, and adherence to design standards..

Methodology to identify bright student

It is done by considering a range of criteria, including academic performance, creativity, critical thinking, problem-solving skills, and enthusiasm for learning. Bright students often excel in multiple areas. Observed how students perform in the classroom. In terms of active participation, engagement in discussions, leadership, and the ability to grasp complex concepts.

Efforts to keep students engaged

1. **Active Learning**: Incorporate active learning strategies, such as group discussions, problem-solving activities, and hands-on projects. Active participation keeps students engaged and encourages critical thinking.
2. **Varied Teaching Methods:** Use a variety of teaching methods, including lectures, group work, multimedia presentations, and interactive activities to cater to different learning preferences.
3. **Technology Integration**: Leverage technology, such as online platforms, educational apps, and interactive software, to make lessons more engaging and interactive.

Methodology to identify weak student

It is done by considering a range of criteria, including classroom observation, formative assessment, summative assessment, assignment review etc. Weak students are struggling students with sensitivity and a desire to support their learning. Some measures, such as additional tutoring, personalized assignments, or alternative assessment methods, to help students succeed.

Targeted inventions for weak student

1. Additional Resources

Offer supplementary learning materials, such as textbooks, online resources, or multimedia content, to provide alternative explanations and reinforce key concepts.

2. Remedial classes

Establish a tutoring program where students can receive extra help from teachers.

3. Flipped classroom

Students are assigned pre-class learning materials, often in the form of videos, readings, or online modules, to cover the foundational concepts before coming to class.