Design of Prestressed Concrete Structures

(Sub Code: GR20D5022)

II Year M.Tech - I Semester

(AY 2021-22)

Mrs. .K.Hemalatha

(Asst. Professor)

Department of Civil Engineering

Gokaraju Rangaraju Institute of Engineering and Technology

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

Design of Prestressed Concrete Structures

Course File Check List

S.No.	Name of the Format	Page No.
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Department of Civil Engineering

M.Tech (Structural Engineering)

Course Name: Design of Prestressed Concrete Structures Course Code: GR20D5022

L: 3 T: 0 P:0 C:3 II Year I Semester

UNIT I Introduction to Prestressed Concrete: Materials - High strength concrete and High tensile steel - Pre-tensioning and Post tensioning methods – Systems of Prestressing.

Losses in Prestress: Losses in Prestress - Analysis of PSC flexural members –Basic concepts-Ultimate strength in flexure –Codal provisions.

UNIT II Statically Determinate PSC Beams: Design of flexural members for ultimate and serviceability limit states – Analysis and design for Shear and Torsion - Codal provisions.

UNIT III Design of End Bocks: Transmission of prestress in Pre-tensioned members – Anchorage zone stresses for Post-tensioned members.

UNIT IV Statically Indeterminate Structures: Analysis and design of continuous beams and frames – Choice of cable profile – Linear transformation and concordancy - Analysis and design of prestressed concrete Pipes and Columns with moments.

UNIT V Composite Construction: Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs **–** Creep and Shrinkage effects – Partial prestressing principles, analysis and design concepts – Crack width calculations.

TEXT BOOKS:

1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.

2. Prestressed Concrete by N.Rajasekharan; - Narosa publications.

REFERENCE BOOKS:

1. Prestressed Concrete by Ramamrutham; Dhanpatrai Publications.

2. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.

Codes: IS 1343 - BIS code of practice for Prestressed concrete.

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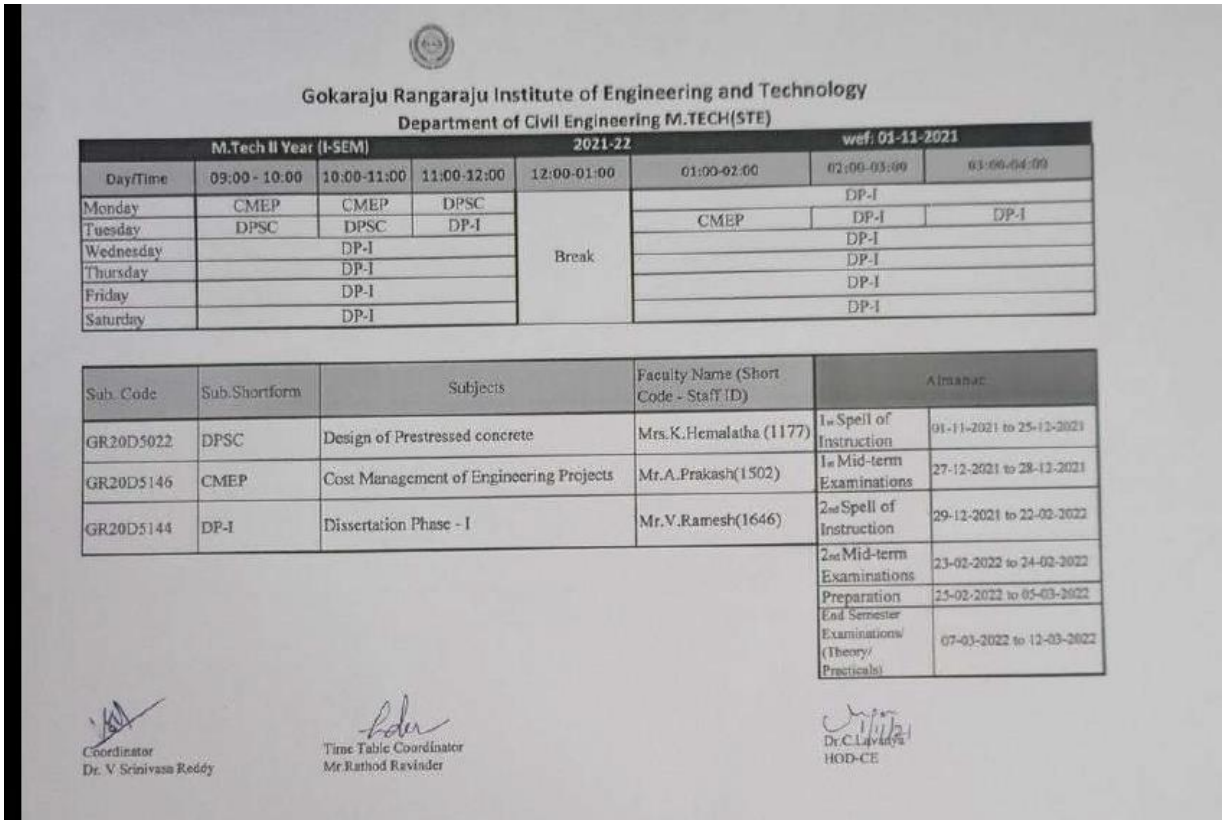
DEPARTMENT OF CIVIL ENGINEERING

CLASS TIME TABLE

II YEAR-A SECTION **ROOM NO: 4112** **W.E.F : 01-11-2021**



Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering M.TECH(STE)

M.Tech II Year (I-SEM)				2021-22		wef: 01-11-2021	
Day/Time	09:00 - 10:00	10:00-11:00	11:00-12:00	12:00-01:00	01:00-02:00	02:00-03:00	03:00-04:00
Monday	CMEP	CMEP	DPSC	Break	DP-I		
Tuesday	DPSC	DPSC	DP-I		CMEP	DP-I	DP-I
Wednesday	DP-I				DP-I		
Thursday	DP-I				DP-I		
Friday	DP-I				DP-I		
Saturday	DP-I				DP-I		

Sub. Code	Sub.Shortform	Subjects	Faculty Name (Short Code - Staff ID)
GR20D5022	DPSC	Design of Prestressed concrete	Mrs.K.Hemalatha (1177)
GR20D5146	CMEP	Cost Management of Engineering Projects	Mr.A.Prakash(1502)
GR20D5144	DP-I	Dissertation Phase - I	Mr.V.Ramesh(1646)

Almanac	
I st Spell of Instruction	01-11-2021 to 25-12-2021
I st Mid-term Examinations	27-12-2021 to 28-12-2021
2nd Spell of Instruction	29-12-2021 to 22-02-2022
2nd Mid-term Examinations	23-02-2022 to 24-02-2022
Preparation	25-02-2022 to 05-03-2022
End Semester Examinations/ (Theory/ Practicals)	07-03-2022 to 12-03-2022

Coordinator
Dr. V. Srinivasa Reddy

Time Table Coordinator
Mr.Rathod Ravinder

Dr.C.Lavanya
HOD-CE

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Department of Civil Engineering

Vision

To become a pioneering centre in civil engineering through quality education, innovation, and entrepreneurship.

Mission

- To produce well qualified and talented engineers by imparting quality education.
- To enhance the skills of entrepreneurship, innovativeness, management and life-long learning in young engineers.
- To inculcate professional ethics and make socially responsible engineers.

Programme Educational Objectives

PEO 1: Graduates of the program will equip with professional expertise on the theories, process, methods and techniques for building high-quality structures in a cost-effective manner**.**

PEO 2: Graduates of the program will be able to design structural components using contempory softwares and professional tools with quality practices of international standards.

PEO 3: Graduates of the program will be effective as both an individual contributor and a member of a development team with professional, ethical and social responsibilities.

PEO 4: Graduates of the program will grow professionally through continuing education, training, research, and adapting to the rapidly changing technological trends globally in structural engineering.

Programme Outcomes: Graduates of the Civil Engineering programme will be able to

PO 1: An ability to independently carry out research and develop solutions for a practical problems in structural engineering.

PO 2: An ability to present technical information in form of structural drawings and documents conforming to desired specifications.

PO 3: The student should develop in-depth proficiency in the analysis and design of advanced structures, HSC/HPC mixes, Shells and foded plates, earth quake resistant buildings, ability to model, discriminate elastic/plastic behaviour of materials and synthesize new designs using contemporary softwares.

PO 4: Ability to assess the impact of professional engineering solutions in environmental context along with societal, health, safety, legal, ethical and cultural issues and the need for sustainable development.

PO 5: Ability to possess critical thinking skills and solve core, complex and multidisciplinary structural engineering problems.

PO 6: Ability to recognize the need for life-long learning to improve knowledge and competence.

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COURSE OBJECTIVES

Academic Year : 2021-2022 **Semester** : **I**

Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering

On completion of this Subject/Course the student shall be able to:

S.No	Objectives
1	Develop an advanced systems of prestressed concrete members
2	Analyze and design the statically determinate prestressed concrete members
3	Demonstrate the stresses with anchorage system in prestressed concrete members.
4	Analyze and design the statically indeterminate prestressed concrete members
5	Analyze and design the composite sections.

Signature of HOD Signature of faculty

Date: Date:

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COURSE OUTCOMES

Academic Year : 2021-2022 **Semester** : **I**

Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering

On completion of this Subject/Course the student shall be able to:

S.No	Outcomes
1	Find out the losses in prestressed concrete and enhance its concepts, which include pre and post tensioning processes.
2	Analyze and Design the statically determinate prestressed concrete members.
3	Design the end blocks of prestressed concrete members.
4	Analyze and Design the statically indeterminate prestressed concrete members.
5	Design the composite structures using prestressed concrete techniques.

Signature of HOD

Date:

Signature of faculty

Date:

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M.Tech II Year I Sem (Structural Engineeering)
Acedemic Year 2021-2022

S.No	ROLL NUMBER	NAME OF THE STUDENT
1	20241D2001	ADUVALA RAJESH KHANNA
2	20241D2002	DURGAM NISHIPRIYA
3	20241D2003	ASHALA SHARATH KUMAR
4	20241D2004	BODDUPALLI JAGADEESH
5	20241D2005	BOODIDA RAKESH KUMAR
6	20241D2006	H KARAN KUMAR
7	20241D2007	JADAV PAVAN KALYAN
8	20241D2008	JAKKULA SRINIVAS
9	20241D2009	JANGA AJAY KUMAR
10	20241D2010	JANGILI VIDYA SAGAR YADAV
11	20241D2011	KANDI USHA SRI
12	20241D2012	KOTLA SAI PRAKASH
13	20241D2013	KOTTE SAI KRISHNA
14	20241D2014	MADAM SAMKEERTHANA
15	20241D2015	MADHIKUNTLA SHIREESHA
16	20241D2016	MALYALA PRIYANKA
17	20241D2017	MANDALA NAVEEN
18	20241D2018	CHENNA JHANSI
19	20241D2019	MOHAMMED YASIR HUSSAIN
20	20241D2020	NARAPA SIVA BHASKAR REDDY
21	20241D2021	POLU SIREESH KUMAR REDDY
22	20241D2022	SAMA MADHAVI
23	20241D2023	SHAIK ANSAR AHMED
24	20241D2024	PANDRALA SANJANA
25	20241D2025	GUGULOTHU AMRUTHAKALA
26	20241D2026	JAGANNADHAM ROHITH KUMAR
27	20241D2027	DAIDA VERONICA PRIYADHARSHINI
28	20241D2028	ALETI GANESH
29	20241D2029	KAKI SAI TULASI PRASANTHI

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Department of Civil Engineering

GUIDELINES TO STUDY THE COURSE SUBJECT

Academic Year : 2021-2022 **Semester** : **I**

Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering

Guidelines to Students

Guidelines to study the Course: Design of Prestressed Concrete Structures

The course helps the students to learn the basics and concepts in Prestressed Concrete, High strength concrete and High tensile steel - Pre-tensioning and Post tensioning methods – Systems of Prestressing. Losses in Prestress - Analysis of PSC flexural members –Basic concepts-Ultimate strength in flexure –Codal provisions. Design of flexural members for ultimate and serviceability limit states – Analysis and design for Shear and Torsion. Transmission of prestress in Pre-tensioned members – Anchorage zone stresses for Post-tensioned members. Analysis and design of continuous beams and frames – Choice of cable profile – Linear transformation and concordancy - Analysis and design of prestressed concrete Pipes and Columns with moments. Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs **–** Creep and Shrinkage effects – Partial prestressing principles, analysis and design concepts – Crack width calculations

So the students should have the prerequisites:

Engineering Mechanics, Strength of Materials, Structural Analysis, Concrete Technology, Design of Reinforced Concrete Structures and Design of Steel

Where will this subject help?

- Useful in calculation of Design of flexural members for ultimate and serviceability limit states.
- This course let the students to work with analysis and design for Shear and Torsion. Transmission of prestress in Pre-tensioned members.
- This course let the students to analysis and design of prestressed concrete Pipes and Columns with moments
- Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs

BOOKS AND MATERIALS

Text Books	
1.	Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2.	Prestressed Concrete by N.Rajasekharan; - Narosa publications

Suggested / Reference Books	
1.	Prestressed Concrete by Ramamrutham; Dhanpatrai Publications
2.	Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.
3.	Codes: IS 1343 - BIS code of practice for Prestressed concrete.
Web Sites	
1	https://nptel.ac.in/courses/105106117
2	https://nptel.ac.in/courses

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COURSE DESIGN AND DELIVERY SYSTEM (CDD)

- The Course syllabus is written into number of learning objectives and outcomes.
- These learning objectives and outcomes will be achieved through lectures, assessments, assignments, experiments in the laboratory, projects, seminars, presentations, etc.
- Every student will be given an assessment plan, criteria for assessment, scheme of evaluation and grading method.
- The Learning Process will be carried out through assessments of Knowledge, Skills and Attitude by various methods and the students will be given guidance to refer to the text books, reference books, journals, etc.

The faculty be able to –

- Understand the principles of Learning
- Understand the psychology of students
- Develop instructional objectives for a given topic
- Prepare course, unit and lesson plans
- Understand different methods of teaching and learning
- Use appropriate teaching and learning aids
- Plan and deliver lectures effectively
- Provide feedback to students using various methods of Assessments and tools of Evaluation
- Act as a guide, advisor, counselor, facilitator, motivator and not just as a teacher alone

Signature of HOD

Date:

Signature of faculty

Date:

Gokaraju Rangaraju Institute of Engineering and Technology

Department of Civil Engineering

COURSE SCHEDULE

Academic Year : 2021-2022 **Semester** : **I**

Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering

The Schedule for the whole Course / Subject is:

S. No.	Description	Duration (Date)		Total No. Of Periods
		From	To	
1.	**UNIT I**	01-11-2021	07-12-2021	15
2.	**UNIT II**	07-12-2021	16-01-2022	11
3.	**UNIT III**	17-01-2022	01-02-2022	9
4.	**UNIT IV**	01-02-2022	14-02-2022	6
5.	**UNIT V**	14-02-2022	22-02-2022	7

1. Total No. of Instructional periods available for the course: **48** Hours / Periods

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Department of Civil Engineering
SCHEDULE OF INSTRUCTIONS
COURSE PLAN

Academic Year : 2021-2022 **Semester** : **I**
Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A
Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022
Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof
Dept.: Civil Engineering

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	Bloom Taxonomy	References (Text Book, Journal…) Page Nos.:____to
1.	1.	01/11/2021	1	Introduction to prestressed concrete	COB's - 1 CO's - 1	K1	674-675
	2.	02/11/2021	1	Definitions involved in PSC	COB's - 1 CO's - 1	K2	674-675
	3.	02/11/2021	1	Assumptions and materials	COB's - 1 CO's - 1	K2	674-680
	4.	08/11/2021	1	Types of prestressing anddevices	COB's - 1 CO's - 1	K2	674-730
	5.	09/11/2021	1	Bending stress concepts	COB's - 1 CO's - 1	K2	674-730
	6.	09/11/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	684-730
	7.	15/11/2021	1	Problem Solving	COB's - 1 CO's - 1	K2	674-730
	8.	16/11/2021	1	Pressure line Concept and problem	COB's - 1 CO's - 1	K1	674-730
	9.	22/11/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	674-675
	10.	23/11/2021	1	Concept of load balancingand Problem Solving	COB's - 1 CO's - 1	K4	674-675
	11	23/11/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	674-680
	12	29/11/2021	1	Cracking Moment andProblem Solving	COB's - 1 CO's - 1	K4	674-730
	13	30/11/2021	1	Losses of Prestressing	COB's - 1 CO's - 1	K2	674-730

	14	06/12/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	684-730
	15	07/12/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	674-730
2.	16	07/12/2021	1	Shear of PSC Beams	COB's –2 CO's - 2	K1	425-426
	17	13/12/2021	1	Problem Solving	COB's –2 CO's - 2	K2	425-426
	18	14/12/2021	1	Problem Solving	COB's –2 CO's - 2	K2	425-429
	19	14/12/2021	1	Types of cracks and Problem solving	COB's –2 CO's - 2	K2	425-429
	20	20/12/2021	1	Torsion of PSC Beams	COB's –2 CO's - 2	K4	451-465
	21	21/12/2021	1	Problem Solving	COB's –2 CO's -2	K1	482-483
	22	21/12/2021	1	Design of Shear problem	COB's –2 CO's - 2	K1	482-514
	23	03/01/2022	1	Design of Torsion problem	COB's –2 CO's - 2	K4	451
	24	04/01/2022	1	Problem Solving	COB's –2 CO's - 2	K4	451
	25	04/01/2022	1	Problem Solving	COB's –2 CO's - 2	K4	451
	26	16/01/2022	1	Problem Solving	COB's –2 CO's - 2	K4	451
3.	27	17/01/2022	1	Transfer of Prestress in Pretensioned member	COB's –3 CO's - 3	K2	601-603
	28	17/01/2022	1	Problem on transmissionlength	COB's –3 CO's - 3	K4	601-622
	29	23/01/2022	1	Problem on transmissionlength	COB's –3 CO's -3	K4	601-618
	31	24/01/2022	1	Flexural bond stresses	COB's –3 CO's - 3	K2	601
	32	24/01/2022	1	Problem Solving	COB's –3 CO's - 3	K4	601
	33	30/01/2022	1	Problem Solving	COB's –3 CO's - 3	K4	601-615
	34	31/01/2022	1	Anchorage Zone or EndBlock	COB's –3 CO's - 3	K2	601-610
	35	31/01/2022	1	Problem Solving	COB's –3 CO's - 3	K4	601-628
	36	01/02/2022	1	Problem Solving	COB's –3 CO's - 3	K4	620-646
4.	37	01/02/2022	1	Analysis and design of continuous beam	COB's - 4 CO's - 4	K4	413-468
	38	07/02/2022	1	Analysis and design of frame	COB's - 4 CO's - 4	K4	413-468
	39	07/02/2022	1	Analysis and design of pipes	COB's - 4 CO's - 4	K4	413-468
	40	08/02/2022	1	Analysis and design ofcolumns	COB's - 4 CO's - 4	K4	413-468
	41	08/02/2022	1	Problem Solving	COB's - 4 CO's -4	K4	413-468
	42	14/02/2022	1	Problem Solving	COB's - 4 CO's - 4	K4	413-468

5.	43	14/02/2022	1	About compositeconstruction	COB's - 5 CO's - 5	K2	413-468
	44	15/02/2022	1	Problem on propped construction	COB's - 5 CO's - 5	K4	1051-1090
	45	15/02/2022	1	Differential shrinkage of composites	COB's - 5 CO's - 5	K2	1051-1090
	46	21/02/2022	1	Deflections of composites	COB's - 5 CO's - 5	K2	1051-1090
	47	21/02/2022	1	Problem Solving	COB's - 5 CO's - 5	K4	1051-1090
	48	22/02/2022	1	Flexural and ShearStrength	COB's - 5 CO's - 5	K2	1051-1090
	49	22/02/2022	1	Design of compositesection	COB's - 5 CO's - 5	K6	1051-1090

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Department of Civil Engineering
SCHEDULE OF INSTRUCTIONS
UNIT PLAN

Academic Year : 2021-2022 **Semester** : **I**
Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A
Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022
Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof
Dept.: Civil Engineering **Unit No: 1**

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Text Book, 2 by Krishna Raju) Page Nos.: to
1.	01/11/2021	1	Introduction to prestressed concrete	COB's - 1 CO's - 1	K1	674-675
2.	02/11/2021	1	Definitions involved in PSC	COB's - 1 CO's - 1	K2	674-675
3.	02/11/2021	1	Assumptions and materials	COB's - 1 CO's - 1	K2	674-680
4.	08/11/2021	1	Types of prestressing and devices	COB's - 1 CO's - 1	K2	674-730
5.	09/11/2021	1	Bending stress concepts	COB's - 1 CO's - 1	K2	674-730
6.	09/11/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	684-730
7.	15/11/2021	1	Problem Solving	COB's - 1 CO's - 1	K2	674-730
8.	16/11/2021	1	Pressure line Concept and problem	COB's - 1 CO's - 1	K1	674-730
9.	22/11/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	674-675
10.	23/11/2021	1	Concept of load balancing and Problem Solving	COB's - 1 CO's - 1	K4	674-675
11.	23/11/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	674-680
12.	29/11/2021	1	Cracking Moment and Problem Solving	COB's - 1 CO's - 1	K4	674-730
13.	30/11/2021	1	Losses of Prestressing	COB's - 1 CO's - 1	K2	674-730
14.	06/12/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	684-730
15.	07/12/2021	1	Problem Solving	COB's - 1 CO's - 1	K4	674-730

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Department of Civil Engineering

SCHEDULE OF INSTRUCTIONS

UNIT PLAN

Academic Year : 2021-2022 **Semester** : **I**
Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A
Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022
Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof
Dept.: Civil Engineering **Unit No: 2**

Lesson No.	Date	No. of Periods	Topics / Sub – Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Text Book, 2 by B S Krishna Raju) Page Nos.: to
1.	07/12/2021	1	Shear of PSC Beams	COB's –2 CO's - 2	K1	425-426
2.	13/12/2021	1	Problem Solving	COB's –2 CO's - 2	K2	425-426
3.	14/12/2021	1	Problem Solving	COB's –2 CO's - 2	K2	425-429
4.	14/12/2021	1	Types of cracks and Problem solving	COB's –2 CO's - 2	K2	425-429
5.	20/12/2021	1	Torsion of PSC Beams	COB's –2 CO's - 2	K4	451-465
6.	21/12/2021	1	Problem Solving	COB's –2 CO's -2	K1	482-483
7.	21/12/2021	1	Design of Shear problem	COB's –2 CO's - 2	K1	482-514
8.	03/01/2022	1	Design of Torsion problem	COB's –2 CO's - 2	K4	451
9.	04/01/2022	1	Problem Solving	COB's –2 CO's - 2	K4	451
10.	04/01/2022	1	Problem Solving	COB's –2 CO's - 2	K4	451
11.	16/01/2022	1	Problem Solving	COB's –2 CO's - 2	K4	451

Signature of HOD
Date:

Signature of faculty
Date:

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Department of Civil Engineering

SCHEDULE OF INSTRUCTIONS

UNIT PLAN

Academic Year : 2021-2022 **Semester** : **I**
Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A
Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022
Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof
Dept.: Civil Engineering **Unit No: 3**

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Krishna Raju) Page Nos.:__to ___
1.	17/01/2022	1	Transfer of Prestree in Pretensioned member	COB's –3 CO's - 3	K2	601-603
2.	17/01/2022	1	Problem on transmission length	COB's –3 CO's - 3	K4	601-622
3.	23/01/2022	1	Problem on transmission length	COB's –3 CO's -3	K4	601-618
4.	24/01/2022	1	Flexural bond stresses	COB's –3 CO's - 3	K2	601
5.	24/01/2022	1	Problem Solving	COB's –3 CO's - 3	K4	601
6.	30/01/2022	1	Problem Solving	COB's –3 CO's - 3	K4	601-615
7.	31/01/2022	1	Anchorage Zone or End Block	COB's –3 CO's - 3	K2	601-610
8.	31/01/2022	1	Problem Solving	COB's –3 CO's - 3	K4	601-628
9.	01/02/2022	1	Problem Solving	COB's –3 CO's - 3	K4	620-646

Signature of HOD

Date:

Signature of faculty

Date:

Gokaraju Rangaraju Institute of Engineering and Technology
Department of Civil Engineering
SCHEDULE OF INSTRUCTIONS
UNIT PLAN

Academic Year : 2021-2022 **Semester** : **I**
Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A
Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022
Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof
Dept.: Civil Engineering **Unit No: 4**

Lesson No.	Date	No. of Periods	Topics / Sub – Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (by Krishna Raju) Page Nos.: __to
1.	01/02/2022	1	Analysis and design of continuous beam	COB's - 4 CO's - 4	K4	413-468
2.	07/02/2022	1	Analysis and design of frame	COB's - 4 CO's - 4	K4	413-468
3.	07/02/2022	1	Analysis and design of pipes	COB's - 4 CO's - 4	K4	413-468
4.	08/02/2022	1	Analysis and design of columns	COB's - 4 CO's - 4	K4	413-468
5.	08/02/2022	1	Problem Solving	COB's - 4 CO's -4	K4	413-468
6.	14/02/2022	1	Problem Solving	COB's - 4 CO's - 4	K4	413-468

Signature of HOD

Date:

Signature of faculty

Date:

Gokaraju Rangaraju Institute of Engineering and Technology
Department of Civil Engineering
SCHEDULE OF INSTRUCTIONS
UNIT PLAN

Academic Year : 2021-2022 **Semester** : **I**

Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering **Unit No: 5**

Lesson No.	Date	No. of Periods	Topics / Sub - Topics	Objectives & Outcomes Nos.	Blooms Taxonomy	References (Krishna Raju) Page Nos.: to
1.	14/02/2022	1	About composite construction	COB's - 5 CO's - 5	K2	413-468
2.	15/02/2022	1	Problem on propped construction	COB's - 5 CO's - 5	K4	1051-1090
3.	15/02/2022	1	Differential shrinkage of composites	COB's - 5 CO's - 5	K2	1051-1090
4.	21/02/2022	1	Deflections of composites	COB's - 5 CO's - 5	K2	1051-1090
5.	21/02/2022	1	Problem Solving	COB's - 5 CO's - 5	K4	1051-1090
6.	22/02/2022	1	Flexural and Shear Strength	COB's - 5 CO's - 5	K2	1051-1090
7.	22/02/2022	1	Design of composite section	COB's - 5 CO's - 5	K6	1051-1090

Signature of HOD Signature of faculty

Date: Date:

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/1/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:1 Duration of Lesson: 1hr

Lesson Title: Introduction to prestressed concrete

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

1. Discuss different terminologies in Prestressing Concrete.

Teaching Aids : white board,
Different colour markers Teaching Points :

Introduction to prestressed concrete

Assignment / Questions:

1. Explain basic assumptions in Prestressed Concrete Structures. COB1, CO1
2. Discuss about Tendons, Anchorages, Pre Tensioning. COB2, CO2

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/2/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:2 Duration of Lesson: 1hr

Lesson Title: Definitions involved in PSC

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

1. Assumptions in Prestressing concrete

Teaching Aids : white board,
Different colour markersTeaching Points :

Different terminologies and materials used in Prestressing Concrete.

Assignment / Questions:

1. List few applications of Prestressing Concrete. COB1, CO1
2. Discuss the differences between Pre tensioning and Post Tensioning. COB1, CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/2/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:3 Duration of Lesson: 1hr

Lesson Title: Assumptions and materials

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Assumptions and materials

Teaching Aids : white board,
Different colour markersTeaching Points :

Assumptions and materials

Assignment / Questions:

1. Explain in detail about different materials used in Prestressed Concrete. COB1, CO 1

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 11/8/2021
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:4		Duration of Lesson: 1hr

Lesson Title: Types of prestressing and devices

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

1. Discuss types of prestressing and devices used

Teaching Aids : white board,
Different colour markersTeaching Points :

Types of prestressing and devices

Assignment / Questions:

1. Explain about the devices used in Prestressing. COB1, CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/9/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:5 Duration of Lesson: 1hr

Lesson Title: Bending stress concepts

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Bending stress concepts

Teaching Aids : white board,
Different colour markersTeaching Points :

Bending stress concepts

Assignment / Questions:

1. Explain about analysis of pre stress and bending stress. COB1, CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/9/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No: 6 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving in Prestressing beams

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. A rectangular Concrete beam of 100mm wide and 250mm deep, spanning over 8m is prestressed by a straight cable carrying an effective force of 250KN located at an eccentricity of 40mm. Calculate the resultant stress distribution for the centre of span. COB1, CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/15/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:7 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Bending stress problems due to dead load and live load.

Assignment / Questions:

1. Find the magnitude of prestressing force with an eccentricity of 40mm which can balance the stresses due to dead load and live load at the soffit of beam. COB1,CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/16/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:8 Duration of Lesson: 1hr

Lesson Title: Pressure line Concept and problem

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Pressure line Concept and problem

Teaching Aids : white board,
Different colour markersTeaching Points :

Pressure line Concept and problem

Assignment / Questions:

1. A rectangular concrete beam 250mm wide and 600mm deep is prestressed by means of 4 nos of 14mm dia located at 200mm from the soffit of the beam. If the effective stress in the wires is 700N/mm. What is the maximum bending moment that can be applied to the section without causing any tension at the soffit of the beam. COB 1, CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/22/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:9 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Pressure line Concept Problems

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving on pressure line concept

Assignment / Questions:

1. A Prestressed concrete beam with a rectangular section 120mm and 300mm deep supports a UDL of 4KN/m which includes the self -weight of the beam. Effective span of beam is 6m. The beam is concentrically prestressed by a cable carrying a force of 180KN. Locate the position of pressure line in beam. COB1,CO1

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 11/23/2021
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:10		Duration of Lesson: 1hr

Lesson Title: Concept of load balancing and Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Concept of load balancing and Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Concept of load balancing and Problem Solving

Assignment / Questions:

1. Find the effective prestressing force in the parabola cable having eccentricity of 80mm at the centre of the span and concentric at the supports for the following Conditions. If the bending effect of the pre stressing force is nullified by imposed load neglecting self weight of beam.
   COB1, CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/23/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:11 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 11/29/2021
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:12		Duration of Lesson: 1hr

Lesson Title: Cracking Moment and Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Cracking Moment and Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Cracking Moment and Problem Solving

Assignment / Questions:

1. Post tensioned concrete slab of length 8m, depth 300mm, width 200mm, eccentricity 100mm, live load of 2.56 KN/m. Calculate the increasing steel stress if the ducts are grouted so that the strain in steel and adjacent concrete is equal. COB1, CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 11/30/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:13 Duration of Lesson: 1hr

Lesson Title: Losses of Prestressing

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Explain various Losses of Prestress

Teaching Aids : white board,
Different colour markersTeaching Points :

Losses of Prestressing

Assignment / Questions:

1. Explain about various losses of Prestress in Concrete and factors affecting them.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 12/6/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:14 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. Explain various losses of prestress in Pre tensioning and Post tensioning.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 12/7/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:15 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. A rectangular section of 150mm X 300mm is prestressed by 8 high tensile wires of 7mm diameter located at 100mm from the soffit of the beam if the wires are tensioned to a stress of 1100 N/mm2. Calculate the % loss of stress due to elastic deformation. COB1,CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 12/7/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:16 Duration of Lesson: 1hr

Lesson Title: Shear of PSC Beams

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Shear of PSC Beams

Teaching Aids : white board,
Different colour markersTeaching Points :

Shear of PSC Beams

Assignment / Questions:

1. A rectangular section of width 150mm and depth 300mm, eccentricity =100mm, Length is 8m, Live load of 2KN/m. Estimate principal stresses at the support section. Determine the effective force in the cable to balance dead load and live load. COB2, CO2

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 12/13/2021
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:17		Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving in shear of Prestressed concrete beam.

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. A rectangular section of width 250mm and depth 600mm, the beam is prestressed by parabolic cable with P= 1000KN cable is concentric at the support , e=100mm at centre of span, L=10m, UDL =20KN/m, density =24KN/m3. Estimate the maximum principal stress developed in the section of beam at a distance of 300mm away from the support.

COB2, CO2

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 12/14/2021
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:18		Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving in principal stresses developed in the PSC beam.

Teaching Aids : white board,

Different colour markersTeaching Points :

Problem Solving in principal stresses developed in the PSC beam.

Assignment / Questions:

1. Calculate the magnitude of principal stress at a point 550mm from the top of cantilever beam at the support section. cantilever beam of length 8m carrying UDL of 60KN/m and 350KN at free end with c/s 600mm X 1000mm

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 12/14/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:19 Duration of Lesson: 1hr

Lesson Title: Types of cracks and Problem solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Types of cracks and Problem solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Types of cracks and Problem solving

Assignment / Questions:

1. Explain a brief note on web shear cracks and Flexural shear cracks.

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 12/20/2021
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:20		Duration of Lesson: 1hr

Lesson Title: Torsion of PSC Beams

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Torsion of PSC Beams

Teaching Aids : white board,
Different colour markersTeaching Points :

Torsion of PSC Beams

Assignment / Questions:

1. The girder of I section is prestressed by a cable having initial stress of 6000KN.The last ratio is 0.85. Estimate Ultimate shear resistance. Width and depth of top flange= 1200X500mm Web of 150mm X 1500mm, width and dept of bottom flange = 300mm X 150mm

COB1, CO1

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 12/21/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:21 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Design of Shear Reinforcement

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving in shear reinforcement design.

Assignment / Questions:

1. A rectangular c/s of 150mm X 300mm , V=130Kn. The uniform prestress Fcp= 5 N/mm2, fck= 40N/mm2, fe 415, HYSD of 8mm diameter. Design suitable spacing of stirrups. Assume cover of 50mm. COB2, CO2

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 12/21/2021
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:22 Duration of Lesson: 1hr

Lesson Title: Design of Shear problem

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Design of Shear problem

Teaching Aids : white board,
Different colour markersTeaching Points :

Design of Shear problem

Assignment / Questions:

1. Discuss various steps involved in the design of shear reinforcement in Prestressed concrete beam COB2, CO2

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/3/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:23 Duration of Lesson: 1hr

Lesson Title: Design of Torsion problem

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Design of Torsion problem

Teaching Aids : white board,
Different colour markersTeaching Points :

Design of Torsion problem

Assignment / Questions:

1. Determine the maximum torque if the section is uniformly prestressed by a force of 450KN. The maximum permissible diagonal tensile stress in concrete is 0.63 N/mm2.

COB2, CO2

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/4/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:24 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving in shear and Torsion in Prestressed Concrete beam

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving in shear and Torsion in Prestressed Concrete beam

Assignment / Questions:

1. Determine the amount of non-Prestressed reinforcement required for the section if the torsional resistance moment of section is to be incurred to 345 KN-m. The permissible tensile stress in the steel is 230N/mm2. Use 50mm cover COB2, CO2

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/4/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:25 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Design of longitudinal reinforcement in Prestressed concrete beam

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving in design of longitudinal reinforcement

Assignment / Questions:

1. Explain the detailed procedure involved in longitudinal reinforcement and transverse reinforcement. COB2, CO2

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/16/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:26 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. Discuss about Skew bending theory. COB2, CO2

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/17/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:27 Duration of Lesson: 1hr

Lesson Title: Transfer of Prestress in Pretensioned member

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Transfer of Prestress in Pretensioned member

Teaching Aids : white board,
Different colour markersTeaching Points :

Transfer of Prestress in Pretensioned member

Assignment / Questions:

1. Discuss about Transmission Length using various theories. COB 3, CO 3

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/17/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:28 Duration of Lesson: 1hr

Lesson Title: Problem on transmission length

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem on transmission length

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem on transmission length

Assignment / Questions:

1. Calculate the transmission length at the end of the pretensioned beam as per Hoyer's method using following data: L=50m, dia of wire =7mm COB3, CO3

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/23/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:29 Duration of Lesson: 1hr

Lesson Title: Problem on transmission length

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem on transmission length

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem on transmission length

Assignment / Questions:

1.Estimate the transmission length at the end of a pretensioned beam prestressed by 7mm dia. Adopt Krishnamurthy empherical formula. Fck= 42 N/mm2 COB3, CO3

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 1/24/2022
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:30		Duration of Lesson: 1hr

Lesson Title: Flexural bond stresses

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Flexural bond stresses in Prestressed Concrete beam

Teaching Aids : white board,

Different colour markersTeaching Points :

Flexural bond stresses

Assignment / Questions:

1. A rectangular cross section of 240mm X 500mm, length of 10m carrying point oads 250KN at 1/3rd distance from both simply supported ends. Compute bond stress between cable Hose and Concrete. COB3, CO3

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/24/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:31 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving in bond stresses between cable and concrete

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving in bond stresses between cable and concrete

Assignment / Questions:

1. A rectangular cross section of 300mm X 600mm, length of 10m carrying point loads 350KN at 1/3rd distance from both simply supported ends. Compute bond stress between cable Hose and Concrete. COB3, CO3

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/30/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:32 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving in bond stresses

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving in bond stresses

Assignment / Questions:

1. A rectangular cross section of 240mm X 500mm, length of 10m carrying point loads 250KN at 1/3rd distance from both simply supported ends. Compute bond stress between cable Hose and Concrete. COB3, CO3

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/31/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:33 Duration of Lesson: 1hr

Lesson Title: Anchorage Zone or End Block

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Anchorage Zone or End Block

Teaching Aids : white board,
Different colour markersTeaching Points :

Anchorage Zone or End Block

Assignment / Questions:

1. Discuss about anchorage zone stresses in Post tensioned members. COB3, CO3

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 1/31/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:34 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving in anchorage zone stresses

Teaching Aids : white board,
Different colour markersTeaching Points :

Anchorage zone stresses problem Solving

Assignment / Questions:

1. Discuss about various steps involved in determining Anchorage stresses. COB3,CO3

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/1/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:35 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving in Anchorage stresses.

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. A rectangular section of 200mm X 300mm with Prestressing force 2000KN acting at 75mm from top and bottom. COB3,CO3

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/1/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:36 Duration of Lesson: 1hr

Lesson Title: Analysis and design of continuous beam

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Analysis and design of continuous beam

Teaching Aids : white board,
Different colour markersTeaching Points :

adnvantages of continuous beamand its appications in PSC

Assignment / Questions:

1. Discuss about effect of prestressing in Continuous beams. COB4, CO4

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/7/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:37 Duration of Lesson: 1hr

Lesson Title: Analysis and design of frame

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Analysis and design of Continuous beams

Teaching Aids : white board,
Different colour markersTeaching Points :

Analysis and design of Continuous beams

Assignment / Questions:

1. A continuous prestressed concrete beam ABC (AB = BC = 10 m) has a uniform rectangular cross-section with a width of 100 mm and depth of 300 mm. The cable carrying an effective prestressing force of 360 kN is parallel to the axis of the beam and located at 100 mm from the soffit. (a) Determine the secondary and resultant moment at the central support B. (b) If the beam supports an imposed load of 1.5 kN/m, calculate the resultant stresses at top and bottom of the beam at B. Assume density of concrete as 24 kN/m. (e) Locate the resultant line of thrust through beam AB.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/7/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:38 Duration of Lesson: 1hr

Lesson Title: Analysis and design of pipes

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Analysis of Continuous beams

Teaching Aids : white board,
Different colour markersTeaching Points :

Analysis of Continuous beams

Assignment / Questions:

1. A prestressed beam having a rectangular crOss sectiun with a width of 120 mm and a depth of 300 nn is continuous over two spans. AB B 8 m. The cable with zero eccentuicily at Statically Indeterminate Structures 449 the ends and an eccentricity of 50 mm towards the top fibres of the beam over the central support, carries an effective force of 500 kN
   (a) Calculate the secondary moment developed at B.
   (b) If the beam supports concentrated loads of 20 kN each at mid-points of span, evaluate the resuitant stresses at the central support section B.
   (c) Locate also the position of the pressure line at section.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/8/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:39 Duration of Lesson: 1hr

Lesson Title: Analysis and design of columns

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Analysis and design of columns

Teaching Aids : white board,
Different colour markersTeaching Points :

Analysis and design of columns

Assignment / Questions:

1. A two span continuous beam ABC is simply supported at A and C and continuous ov It is pre-stressed with straight cable which lies 100mm below CGC. Determine the seconu moment at 'B' if F = 120kN. Take AB BC = 8m.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/8/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:40 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. Beam of uniform section shown in Fig. 9.13 as pre-stress concrete with an effective pre-stressing force of 300kN.
   a. Sketch the C-line due to the pre-stress alone
   b. Suggest a concordant cable profile
   C. Determine SM and secondary reactions
   d. Also sketch the C-line when the span AB and BC carry imposed load of 15kN/m and 5kN/m respectively. Also determine the stress distribution across the section which lies at 'B.

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/14/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:41 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. Design a continuous PSC beam of two spans AB and BC of 12m in length to support a UDL of 10KN/m. Tensile stresses are not permitted in concrete and the compressive strength on concrete is not to exceed 13MPa.Sketch the details of the cable profile and check the stresses developed at the support and span sections. COB4,CO4

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/14/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:42 Duration of Lesson: 1hr

Lesson Title: About composite construction

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Advantages and disadvantages about composite construction

Teaching Aids : white board,
Different colour markersTeaching Points :

Advantages and disadvantages about composite construction

Assignment / Questions:

1. Explain briefly about advantages and disadvantages of Composite construction. COB5,CO5

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/15/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:43 Duration of Lesson: 1hr

Lesson Title: Problem on propped construction

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem on propped construction

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem on propped construction

Assignment / Questions:

1. Mention the differences between propped and Unpropped construction.
   COB5,CO5

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 2/15/2022
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:44		Duration of Lesson: 1hr

Lesson Title: Differential shrinkage of composites

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Differential shrinkage of composites

Teaching Aids : white board,
Different colour markersTeaching Points :

Differential shrinkage of composites

Assignment / Questions:

1. a) A composite T Beam is made up of a pretensioned rib 100 mm wide and 200 mm deep and a cast in situ slab, 400 mm wide and 40 mm thick having a modulus of elasticity of 28 KN/mm2. If the differential shrinkage is 100x10-6 units, estimate the shrinkage stresses developed in the precast and cast in situ units.
   b) Select some typical cross section of composite bridge decks with precast prestressed elements and explain with neat sketch.

COB 5, CO5

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 2/21/2022
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:45		Duration of Lesson: 1hr

Lesson Title: Deflections of composites

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Deflections of composites

Teaching Aids : white board,
Different colour markersTeaching Points :

Deflections of composites

Assignment / Questions:

1. a) A composite T-girder of span 5 m is made up of a pretensioned rib of 100 mm wide and 200 mm deep, with an in-situ cast slab of 400 mm wide and 40 mm thick. The rib is prestressed by a straight cable having an eccentricity of 33.33 mm and carrying an initial force of 150kN. The loss of prestress may be assumed to be 15%. Design and check the composite T-beam for the limit state of deflection if it supports an imposed load of 3.2 KN/m for unpropped construction. Assume E as 35kN/m2 for both.

COB5,CO5

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/21/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:46 Duration of Lesson: 1hr

Lesson Title: Problem Solving

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Problem Solving

Teaching Aids : white board,
Different colour markersTeaching Points :

Problem Solving

Assignment / Questions:

1. Summarize the advantages of using composite construction with prestressed and in situ concrete in structural members COB5,CO5

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LESSON PLAN

Academic **Y**ear	: 2021-22	Date: 2/22/2022
Semester	: II Year I Semester	
Name of the Program	: B.Tech	Section : A
Course/Subject	: Design of Prestressed Concrete Structures	Course Code: GR20D5022
Name of the Faculty	: Mrs K Hemalatha	
Designation	: Asst. Professor	
Lesson No:47		Duration of Lesson: 1hr

Lesson Title: Flexural and Shear Strength

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Flexural and Shear Strength

Teaching Aids : white board,
Different colour markersTeaching Points :

Flexural and Shear Strength

Assignment / Questions:

1. A composite T Beam is made up of a pretensioned rib 100 mm wide and 200 mm deep and a cast in situ slab, 400 mm wide and 40 mm thick having a modulus of elasticity of 28 KN/mm2. If the differential shrinkage is 100x10-6 units, estimate the shrinkage stresses developed in the precast and cast in situ units. COB5, CO5

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LESSON PLAN

Academic **Y**ear : 2021-22 Date: 2/22/2022
Semester : II Year I Semester
Name of the Program : B.Tech Section : A
Course/Subject : Design of Prestressed Concrete Structures Course Code: GR20D5022
Name of the Faculty : Mrs K Hemalatha
Designation : Asst. Professor
Lesson No:48 Duration of Lesson: 1hr

Lesson Title: Design of composite section

Instructional/Lesson Objectives:

On completion of this lesson the student shall be able to:

Design of composite section

Teaching Aids : white board,
Different colour markersTeaching Points :

Design of composite section

Assignment / Questions:

1. Discuss various steps involved in the design of composite section. COB5, CO5

Signature of Faculty

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Department of Civil Engineering

COURSE COMPLETION STATUS

Academic Year : 2021-2022 **Semester** : **I**

Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering

Units	Remarks	No. of Objectives Achieved	No. of Outcomes Achieved
Unit 1	Covered on time	1	1
Unit 2	Covered on time	1	1
Unit 3	Covered on time	1	1
Unit 4	Covered on time	1	1
Unit 5	Covered on time	1	1

Signature of HOD

Date:

Signature of faculty

Date:

Gokaraju Rangaraju Institute of Engineering and Technology
Department of Civil Engineering
EVALUATION STRATEGY

Academic Year : 2021-2022 **Semester** : **I**

Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering

1. TARGET:
 a) Percentage for pass: 90%
 b) Percentage of class:
 Total Strength: 29

First class with distinction	17
First class	9
Pass class	3
Total strength (No's)	29

2. COURSE PLAN & CONTENT DELIVERY

- 55 classes held for detailed demonstration of each topic and for analysis of problems in the class.

3 METHOD OF EVALUATION

3.1 Continuous Assessment Examinations

- Assignments: Assignments to assess the knowledge of the student on the basics and concepts in Prestressed Concrete, High strength concrete and High tensile steel - Pre-tensioning and Post tensioning methods – Systems of Prestressing. Losses in Prestress - Analysis of PSC flexural members –Basic concepts- Ultimate strength in flexure –Codal provisions. Design of flexural members for ultimate and serviceability limit states – Analysis and design for Shear and Torsion. Transmission of prestress in Pre-tensioned members – Anchorage zone stresses for Post-tensioned members. Analysis and design of continuous beams and frames – Choice of cable profile – Linear transformation and concordancy - Analysis and design of prestressed concrete Pipes and Columns with moments. Analysis and design of composite construction with precast PSC beams and cast in situ RC slabs – Creep and Shrinkage effects – Partial prestressing principles, analysis and design concepts – Crack width calculations.
- Seminars: To assess the knowledge of the student in Prestressed Concrete.
- Quiz: To assess the knowledge of the student in various concepts and basics in Prestressed Concrete.
- Internal Examination: Internal Examinations to assess their overall knowledge in Prestressed Concrete.

3.2. Semester/End Examination

To test their abilities in the course Design of Prestressed Concrete Structures and toapprove their abilities learnt during the same.

4. List out any new topic(s) or any innovation you would like to introduce in teaching the subjects in this Semester.

Introduce drawing of reinforcement details.

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Signature of HOD
Date:

Signature of faculty
Date:

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Mappings of CO's, COB's Vs PO's, POB's

Course Objectives - Course Outcomes Relationship Matrix

Assessment:

1. Assignment 2. Internal Examination 3. External Examination
4. Practical Projects 5. Viva

GR20D5022/ **Design of Prestressed Concrete Structures**	**Course Outcomes**				
Course Objectives	1	2	3	4	5
1	X				
2		X			
3			X		
4				X	
5					X

GR20D5022/ **Design of Prestressed Concrete Structures**	**Course Outcomes**				
Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X

GR20D5022/ **Design of Prestressed Concrete Structures**	**Course Objectives**				
Assessments	1	2	3	4	5
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X

GR20D 5022	Design of Prestressed Concrete Structures	1.Find out the losses in prestressed concrete and enhance its concepts, which include pre and post tensioning processes	M		M	M	H	H
		2.Analyze and Design the statically determinate prestressed concrete members.		M	H	M	M	H
		3.Design the end blocks of prestressed concrete members		M	H	M	M	H
		4.Analyze and Design the statically indeterminate prestressed concrete members		M	H	M	M	H
		5.Design the composite structures using prestressed concrete techniques		M	H	M	M	H

RUBRIC TEMPLATE

Academic Year : 2021-2022 **Semester** : **I**
Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A
Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022
Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof
Dept.: Civil Engineering

Objective: To learn design aspects of prestressed concrete structures.
Student Outcome: Learn design concepts, use of code, design of elements such as beams, columns and slabs against strength and serviceability.

			Beginning	**Developing**	**Reflecting Development**	**Accomplished**	**Exemplary**	**Score**
S. No	**Name of the Student**	**Performance Criteria**	**1**	**2**	**3**	**4**	**5**	
1	2024 1D20 15	The level of knowledge on basic requirements for design	Low level of knowledge on basic rquirements of design	Able to discuss the basic requirements of design	Ability to explain the basic requirements of design	Full knowledge on basic requirements of design	Analysing and implementing the knowledge of requirements of design	5
		The level of knowledge on design of structural elements.	Low level of knowledge on design of structural elements.	Able to discuss on design of structural elements.	Ability to explain design of structural elements.	Full knowledge on design of structural elements.	Analysing and application of knowledge on design of structural elements.	5
		The level of knowledge to analyse serviceability of structural elements	Low level of knowledge to analyse serviceability of structural elements	Ability to discuss and to study the serviceability of structural elements	Ability to explain the serviceability of structural elements.	Full knowledge on serviceability of structural elements	Analysing and implementing the knowledge of serviceability of structural elements	5
							Average Score	5

			Beginning	Developing	Reflecting Development	Accomplished	Exemplary	Score
S. No	**Name of the Student**	**Performance Criteria**	**1**	**2**	**3**	**4**	**5**	
1	2024 1D20 24	The level of knowledge on basic requirements for design	Low level of knowledge on basic rquirements of design	Able to discuss the basic requirements of design	Ability to explain the basic requirements of design	Full knowledge on basic requirements of design	Analysing and implementing the knowledge of requirements of design	4
		The level of knowledge on design of structural elements.	Low level of knowledgeon design of structural elements.	Able to discuss on design of structural elements.	Ability to explain design of structural elements.	Full knowledge on design of structural elements.	Analysing and application of knowledge on design of structural elements.	4
		The level of knowledge to analyse serviceability of structural elements.	Low level of knowledge to analyse serviceability of structural elements.	Ability to discuss and to study the serviceability of structural elements.	Ability to explain the serviceability of structural elements.	Full knowledge on serviceability of structural elements.	Analysing and implementing the knowledge of serviceability of structural elements.	4
							Average Score	4

			Beginning	Developing	Reflecting Development	Accomplished	Exemplary	Score
S. No	**Name of the Student**	**Performance Criteria**	**1**	**2**	**3**	**4**	**5**	
1	2024 1D2018	The level of knowledge on basic requirements for design	Low level of knowledge on basic rquirements of design	Able to discuss the basic requirements of design	Ability to explain the basic requirements of design	Full knowledge on basic requirements of design	Analysing and implementing the knowledge of requirements of design	3
		The level of knowledge on design of structural elements.	Low level of knowledgeon design of structural elements.	Able to discuss on design of structural elements.	Ability to explain design of structural elements.	Full knowledge on design of structural elements.	Analysing and application of knowledge on design of structural elements.	3
		The level of knowledge to analyse serviceability of structural elements.	Low level of knowledge to analyse serviceability of structural elements.	Ability to discuss and to study the serviceability of structural elements.	Ability to explain the serviceability of structural elements.	Full knowledge on serviceability of structural elements.	Analysing and implementing the knowledge of serviceability of structural elements.	3
							Average Score	3

Gokaraju Rangaraju Institute of Engineering and Technology (Autonomous)

Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

ASSIGNMENT I

Academic Year : 2021-2022 **Semester** : **I**
Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering

1. Distinguish between pre and post tensioning method.
2. A prestressed concrete beam of section 120 mm wide and 300 mm deep is used over an effective span of 6 m to support a udl of 4 kN/m, which includes the self-weight of the beam. The beam is prestressed by straight cable carrying a force of 180 KN and located at an eccentricity of 50 mm. Determine the location of the thrust line in the beam and plot its position at quarter and central span section.
3. A prestressed concrete beam, 200 mm wide and 300 mm deep, is prestressed with wires area is equal to 320 mm2 located at a constant eccentricity of 50 mm and carrying an initial stress of 1000 N/mm2. The span of the beam is 10 m. Calculate the percentage loss of stress in wires in pre tensioning and post tensioning using the following data: Es 210 kN/mm2, relaxation of stress in steel 5% of initial stress, shrinkage of concrete $300x10^{-6}$ for pre tensioning and $200x10^{-6}$ for post tensioning, creep coefficient is 1.6 and slip at anchorage is 1 mm.
4. A cantilevered portion of prestressed concrete bridge with a rectangular cross section 600 mm wide and 1650 mm deep is 8 m long and carries a reaction of 350 kN from the suspended span at the free end, together with a udl of 60 kN/m inclusive of its own weight. The beam is prestressed by seven cable each carrying a force of 1000 kN, of which three are located at 150 mm, three at 400 mm and one at 750 mm from the top edge. Calculate the magnitude of the principal stresses at a point 550 mm from the top of cantilever at the supports. [CO2]
5. A prestressed girder of rectangular section 150 mm wide and 300 mm deep, is to be designed to support an ultimate shear force of 130 kN. The uniform prestress across the section is 5 N/mm2. Design the suitable spacing for the stirrups as per IS1343-2012. Take Fe415, M40 and an effective cover as 50 mm.
6. Estimate the transmission length at the ends of a pretensioned beam prestressed by 7-mm diameter wires. Assume the cube strength of concrete at transfer as 42 N/mm^2

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Bachupally, Kukatpally, Hyderabad – 500 090. (040) 6686 4440

ASSIGNMENT II

Academic Year : 2021-2022 **Semester** : **I**
Name of the Program: M. Tech Structural Engg. **Year:** II Year **Section:** A

Course/Subject : Design of Prestressed Concrete Structures **Course Code**: GR20D5022

Name of the Faculty : Mrs K Hemalatha **Designation:** Asst.Prof

Dept.: Civil Engineering

1. The end block of prestressed concrete girder is 200 mm wide and 300 mm deep. The beam is post tensioned by two Freyssinet anchorages each of 100 mm diameter with their centres located at 75 mm from the top and bottom of the beam. The force transmitted by each anchorage being 2000kN. Computethe bursting force and design suitable reinforcements as per IS1343.
2. Estimate the transmission length at the ends of a pretensioned beam prestressed by 7-mm diameter wires by using Krishna Murthy empirical relation. Assume the cube strength of concrete at transfer as 42 N/ mm^2.
3. A continuous prestressed concrete beam ABC (AB=BC=10 m) has a uniform rectangular cross section with a width of 100 mm and depth of 300 mm. The cable carrying an effective prestressing force of 360 kN is parallel to the axis of the beam and located at 100 mm from the soffit. Determine the secondary and resultant moment at the central support B and locate the resultant line of thrust through beam AB.

4. A composite T Beam is made up of a pretensioned rib 100 mm wide and 200 mm deep and a cast in situ slab, 400 mm wide and 40 mm thick having a modulus of elasticity of 28 kN/mm^2. If the differential shrinkage is $100x10^{-6}$ units, determine the shrinkage stresses developed in the precast and cast in situ units.
5. A composite T-girder of span 5 m is made up of a pretensioned rib of 100 mm wide and 200 mm deep, with an in situ cast slab of 400 mm wide and 40 mm thick. The rib is prestressed by a straight cable having an eccentricity of 33.33 mm and carrying an initial force of 150kN. The loss of prestress may be assumed to be 15%. Check the composite T-beam for the limit state of deflection if it supports an imposed load of 3.2 kN/m for (a) unpropped construction and (b) propped construction. Assume E as 35kN/m^2 for both.

6. Design a composite slab for the bridge deck using a standard inverted I section. The top flange is 250mm wide and 100 mm thick. The bottom flange is 500 mm wide and 250mm thick. The web thickness is 100mm and over all depth of the section is 655 mm. it has to support a live load of 50 kN/m^2 over an effective span of 12 m. Using M40 grade for pretensioned beam at a transfer of 36 N/mm^2 and M30 for cast in situ slan. Determine the minimum prestress necessary.

M.Tech II Year I Semester Regular Examinations, March 2022

DESIGN OF PRESTRESSED CONCRETE

Model Question Paper

(Structural Engineering)

Time: 3 hours **Max Marks: 70**

Instructions:

1. Question paper comprises of **Part-A** and **Part-B**
2. **Part-A** (for 20 marks) must be answered at one place in the answer book.
3. **Part-B** (for 50 marks) consists of **five questions with internal choice,** answer all questions.

PART – A

(Answer ALL questions. All questions carry equal marks)

10 * 2 = 20 Marks

1. a.	Explain the principle of prestressing.	**[2]**
b.	What are the advantages of prestressed concrete?	**[2]**
c.	What is curvature effect?	**[2]**
d.	Explain the effect of torsion on prestressed concrete sections.	**[2]**
e.	State the assumptions made in the analysis of prestressed concrete flexural members	**[2]**
f.	What are the various methods generally used for the investigation of anchorage zone stressed?	**[2]**
g.	Explain about concordancy.	**[2]**
h.	What are cap cables and where are they used?	**[2]**
i.	What is the influence of differential shrinkage on composite prestressed concrete members?	**[2]**
j.	List the commonly used method to analyse secondary moments in prestressed concrete continuous members.	**[2]**

PART – B

(Answer ALL questions. All questions carry equal marks)

5 * 10= 50 Marks

2. A prestressed concrete beam supports a live load of 4kN/m over a simply supported span of 8m. The beam has an I-section with an overall depth of 400mm. The thickness of the flange and web are 60 and 80mm, respectively. The width of the flange is 200mm. They beam is to be prestressed by an effective prestressing force of 235kN at a suitable eccentricity such that the resultant stress at the soffit of the beam at the centre of the span is zero. Find the eccentricity required for the force.If the tendon is concentric, what should be the magnitude of the prestressing force for the resultant stress to be zero at the bottom fiber of the central span section.

OR

3. **(a)** Explain the limitations of prestressed concrete. **[10]**

(b) A prestress concrete beam spanning over 8m is of rectangular section, 150mm wide
and 300mm deep. The beam is prestressed bya parabolic cable having an eccentricity of 75mm below the centroidal axis at centre of span and an eccentricity of 25mm above the centroidal axis at the support sections. The initial force in the cable s 350kN. The beam supports three concentrated loads of 10kN each atintervals of 2m. E_c= 38kN/mm^2.Neglecting losses of prestress, estimate the short-term deflection due to (prestress+ self weight); and Allowing for 20% loss inprestress, estimate the long-term deflection under (prestress+ self weight+ live load), assuming creep coefficient as 1.80.

4. A PSC beam of effective span 15m is of rectangular section 500mm wide and 1000mm deep. A tendons consist of 3600mm^2 of strands of characteristic strength 1700 N/mm^2 with an effective prestress of 910 N/mm^2 . The strands are located 870mm from the top face of the beam. If f_{cu} =60 N/mm^2 , estimate the flexural strength of the section as per BS provisions for the following cases: (i)Bonded tendons (ii) Unbonded tendons. **[10]**

OR

5. **(a)** Explain the various losses of prestress in post-tensioned members. **[10]**

(b) A prestressed girder of rectangular section 150 mm wide and 300 mm deep, is to be designed to support an ultimate shear force of 130 kN. The uniform prestress across the section is 5 N/mm^2. Design the suitable spacing for the stirrups as per IS1343-2012. Take Fe415, M40 and an effective cover as 50 mm.

6. A high-tensile cable comprising 12 strands of 15 mm diameter (12K15 of PSC Freyssinet system) with an effective force of 2500 kN is anchored concentrically in an end block of a post- tensioned beam. The end block is 400 mm wide by 800 mm deep and the anchor plate is 200 mm wide by 260 mm deep. Design suitable anchorage zone reinforcements using Fe-415 grade HYSD bars using IS:1343 code provisions**.** **[10]**

OR

7. Design an I-section for a simply supported post-tensioned concrete beam of span 18 m subjected to an imposed load of 25 kN/m over its entire span. The permissible tensile stress in steel is 1250 N/mm^2 and the permissible stresses in concrete are: At transfer: 20 N/mm^2 (Compression) and 2.5 N/mm^2 (Tensile). At working load: 15 N/mm^2 (Compression) and 1.5 N/mm^2 (Tensile). **[10]**

8. A prestressing force of 400 kN is to be transmitted through a distribution plate 200 mm × 150 mm, the centre of which is located at 150 mm from the bottom of an end block of section 200 mm × 400 mm. Determine the position and magnitude of maximum tensile stress on a horizontal section passing through the centre of the distribution plate. **[10]**

OR

9. A continuous prestressed concrete beam ABC (AB = BC = 10 m) has a uniform rectangular cross-section with a width of 100 mm and depth of 300 mm. The cable carrying an effective prestressing force of 360 kN is parallel to the axis of the beam and located at 100 mm from the soffit. **[10]**

(i) Determine the secondary and resultant moment at the central support B.

(ii) If the beam supports an imposed load of 1.5 kN/m, calculate the resultant stresses attop and bottom of the beam at B. Assume density of concrete as 24 kN/m^3.

10. A simply supported pre-tensioned concrete beam of cross-section 200 mm× 350 mm has an effective span of 8 m, is prestressed by tendons with their centroid is 150 mm from the bottom of the beam. The initial prestressing force in tendons is 400 kN. The beam is incorporated in a composite T-beam by casting a top flange of width 450 mm and thickness 60 mm. If the composite beam is subjected to a live load of 15 kN/m^2, determine the resultant stresses developed in the precast and cast-in-situ concrete assuming the pre-tensioned beam is propped. Adopt the loss of prestress as 20% and the modulus of elasticity of concrete in precast and cast-in-situ is the same. **[10]**

11. **11**. A two-span continuous concrete beam ABC (AB=BC=12 m) has a rectangular section, 300 mm wide & 800 mm deep. The beam is prestressed by a cable carrying an effective force of 700 kN. The cable has a linear profile in the span AB & parabolic profile in span BC. The eccentricities of the cable are +50 mm at A, -100 mm at a distance of 7 m from A & +200 mm at support B & -200 mm at mid span of BC (- below and + above centroidal axis). Sketch the line of thrust in the beam if it supports a uniformly distributed load of 5 KN/m which includes the self-weight of the beam. Find the resultant stress distribution at the mid- support section**.[10]**

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

(Autonomous)

IIM.TechI Semester Mid- IExaminations

DESIGN OF PRESTRESSED CONCRETE

(Structural Engineering)

Time: 90 Minutes **Max Marks: 20**

	SUBJECTIVE (Answer ALL questions. All questions carry equal marks)Time: 75 Minutes3 * 5 =15 Marks			
1	A prestressed concrete beam of section 120 mm wide and 300 mm deep is used over an effective span of 6 m to support a udl of 4 kN/m, which includes the self-weight of the beam. The beam is prestressed by straight cable carrying a force of 180 KN and located at an eccentricity of 50 mm. Determine the location of the thrust line in the beam and plot its position at quarter and central span section.	**[5]**	**CO**	**BL**
2	(a) Distinguish between pre and post tensioned members. (b) Explain the need for high strength steel and concrete in prestressedconcrete structures.	**[5]**	**CO**	**BL**
3	A cantilevered portion of prestressed concrete bridge with a rectangular cross section 600 mm wide and 1650 mm deep is 8 m long and carries a reaction of 350 kN from the suspended span at the free end, together with a udl of 60 kN/m inclusive of its own weight. The beam is prestressed by seven cable each carrying a force of 1000 kN, of which three are located at 150 mm, three at 400 mm and one at 750 mm from the top edge. Calculate the magnitude of the principal stresses at a point 550 mm from the top of cantilever at the supports.	**[5]**	**CO**	**BL**
4	A prestressed girder of rectangular section 150 mm wide and 300 mm deep, is to be designed to support an ultimate shear force of 130 kN. The uniform prestress across the section is 5 N/mm2. Design the suitable spacing for the stirrups as per IS1343-2012. Take Fe415, M40 and an effective cover as 50 mm.	**[5]**	**CO**	**BL**
5	(a) Discuss aboutweb cracks and shear cracks with the help of sketches. (b) Explain the effect of torsion on prestressed concrete sections.	**[5]**	**CO**	**BL**
6	A prestressed concrete beam, 200 mm wide and 300 mm deep, is prestressed with wires area is equal to 320 mm2 located at a constant eccentricity of 50 mm and carrying an initial stress of 1000 N/mm2. The span of the beam is 10 m. Calculate the percentage loss of stress in wires in pre tensioning and post tensioning using the following data: E_s= 210 KN/mm2, relaxation of stress in steel 5% of initial stress, shrinkage of concrete $300x10^{-6}$ for pre tensioning and $200x10^{-6}$ for post tensioning, creepcoefficient is 1.6 and slip at anchorage is 1 mm.	**[5]**	**CO**	**BL**

OBJECTIVE
Multiple Choice Questions (MCQs)
(Answer ALL questions. All questions carry equal marks)
Time: 15 Minutes10 * $^1/_2$ = 5 Marks

1	Loss of stress due to elastic deformation of concrete depends upon (a) Relaxation of Steel (b) Friction and Anchorage Slip (c) Modular Ratio (d) None	**[ ]**
2	Loss of stress due to friction depends upon (a) Modulus of Elasticity of Concrete (b) Coefficient of Friction (c) Relaxation of Steel (d) All the above	**[ ]**
3	Horizontal or axial prestressingof concrete beams (a) Reduces the shear strength of the member (b) Has no effect on the shear strength (c) Increases the shear strength (d) All the above	**[ ]**
4	Ultimate shear strength of prestressed beams failing due to flexure-shear cracks isinfluenced by (a) The width of the section (b) Effective prestress after all loses (c) Tensile strength of concrete (d) Shear strength of concrete.	**[ ]**
5	The ideal cross-section recommended to resist shear and torsion in bridge girders is (a) Rectangular (b) Tee (c) Hollow box (d) I section	**[ ]**
6	Eccentric tendons in a concrete beam section induce (a) Only direct stress (b) Only bending stress (c) Direct and bending stress (d) Only Shear stress	**[ ]**
7	Uniformly distributed load on a concrete beam can be effectively counter balancedby selecting (a) a Concentric cable (b) an Eccentric cable (c) a Parabolic cable (d) a Trapezoidal cable	**[ ]**
8	Resultant stress in the cross-section of a prestressed beam comprises of (a) Prestress + Dead-Load stress + Live-Load stress (b) Prestress + Dead-Load stress (c) Prestress + Live-Load stress (d) Dead Load + Live Load	**[ ]**
9	At the end face of a pretensioned beam the tensile stress in steel is (a) Maximum (b) Zero (c) Minimum (d) Cannot define	**[ ]**
10	At a distance equal to the transmission length from the end face of a pretensioned beam, the force in the tendon is (a) Zero (b) 50 per cent of the initial prestressing force (c) Equal to the initial prestressing force (d) 75 per cent of the initial prestressing force	**[ ]**

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

(Autonomous)

IIM.TechI Semester Mid- IIExaminations

DESIGN OF PRESTRESSED CONCRETE

(Structural Engineering)

Time: 90 Minutes Date of Exam:23-02-2022 Max Marks: 20

SUBJECTIVE **(Answer ALL questions. All questions carry equal marks)** **Time: 75 Minutes3 * 5 =15 Marks**				
1	Estimate the transmission length at the ends of a pretensioned beam prestressed by 7-mm diameter wires by using Krishna Murthy empirical relation. Assume the cube strength of concrete at transfer as 42 N/ mm^2	**[5]**	**CO3**	**BL3**
2	A pre-stressed concrete beam 250 mm wide and 650 mm deep is subjected to an effective prestressing force of 1360 kN along the longitudinal centroidal axis. The cables are placed symmetrically over mild steel anchor plate of area 150 mm x 350 mm. Design the end block. Take the characteristic strength of concrete and its cube strength at transfer as 30 N/mm^2. Assume initial prestressing force=1.2 times the effective prestressing force.	**[5]**	**CO3**	**BL4**
3	A continuous prestressed concrete beam ABC (AB=BC=10 m) has a uniform rectangular cross section with a width of 100 mm and depth of 300 mm. The cable carrying an effective prestressing force of 360 kN is parallel to the axis of the beam and located at 100 mm from the soffit. Determine the secondary and resultant moment at the central support B and locate the resultant line of thrust through beam AB	**[5]**	**CO4**	**BL4**
4	A prestressed girder of rectangular section 150 mm wide and 300 mm deep, is to be designed to support an ultimate shear force of 130 KN. The uniform prestress across the section is 5 N/mm2. Design the suitable spacing for the stirrups as per IS1343-2012. Take Fe415, M40 and an effective cover as 50 mm.	**[5]**	**CO4**	**BL4**
5	A composite T-girder of span 5 m is made up of a pretensioned rib of 100mm wide and 200 mm deep, with an in-situ cast slab of 400 mm wide and 40 mm thick. The rib is prestressed by a straight cable having an eccentricity of 33.33 mm and carrying an initial force of 150kN. The loss of prestress may be assumed to be 15%. Check the composite T-beam forthe limit state of deflection if it supports an imposed load of 3.2 KN/m for unpropped construction.Assume E as 35kN/m^2 for both	**[5]**	**CO5**	**BL5**
6	A composite T Beam is made up of a pretensioned rib 100 mm wide and 200 mm deep and a cast in situ slab, 400 mm wide and 40 mm thick having a modulus of elasticity of 28 KN/mm^2. If the differential shrinkageis $100x10^{-6}$ units, determine the shrinkage stresses developed in the precast and cast in situ units.	**[5]**	**CO5**	**BL5**

OBJECTIVE

Multiple Choice Questions (MCQs)

(Answer ALL questions. All questions carry equal marks)

Time: 10 Minutes Date:23-02-202210 * 1/2 = 5 Marks

1	The resultant stresses in concrete at any section are obtained by the effect of (a) Prestress and torsion stresses(b) Prestress and shear stresses (c) Prestress and flexural stresses(d) Prestress and bending stresses	[ ]
2	The concept of pressure line is very useful in understanding the concept of (a) Bending mechanism (b) Shear mechanism (c) Torsion mechanism (d) Load carrying mechanism	[ ]
3	The soffit of the beam after the transfer of prestress to concrete will be under (a) Bondage (b) Breakage (c) Compression (d) Tension	[ ]
4	If the direct stresses are compressive, then the magnitude of principal stresses in prestressed concrete member gets (a) Zero (b) Increased (c) Decreased (d) Constant	[ ]
5	The ultimate shear resistance of prestressed concrete with web shear cracking but without flexural crakes & mainly governed by (a) Zero (b) Limiting value(c) Infinity(d) Constant	[ ]
6	In the anchorage zone or the end block of a post tensioned prestressed concrete element, the state of stress distribution is considered as (a) Unity(b) Zero (c) Complex (d) Easy	[ ]
7	Due to the effect of composite action sizes of precast prestressed units can be (a) Serviced(b) Increased (c) No change(d) Reduced	[ ]
8	Concordant cable profile is (a) that produce no support reaction due to prestressing (b) parabolic in nature (c) produce no bending moment at the supports of beam (d) laid corresponding to axial stress diagram	[ ]
9	The prestressed concrete member develops deformation under the influence of (a) Self weight(b) Stress strain diagram (c) Flexural moments (d) Prestress and transverse loads	[ ]
10	At a distance equal to the transmission length from the end face of a pretensioned beam, the force in the tendon is (a) Zero (b) 50 per cent of the initial prestressing force (c) Equal to the initial prestressing force 75 per cent of the initial prestressing force	[

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Department of Civil Engineering

STRUCTURAL ENGINEERING

Mid II Examination Attendance Sheet

Sub: Design of Prestressed Concrete Structures

Room No: 4112 **Date:22/02/22 (FN)**

S.No	ROLL NUMBER	NAME OF THE STUDENT	Booklet No	Signature
1	20241D2001	ADUVALA RAJESH KHANNA	414042	
2	20241D2002	DURGAM NISHIPRIYA	414057	
3	20241D2003	ASHALA SHARATH KUMAR	414058	
4	20241D2004	BODDUPALLI JAGADEESH	84524	B. Jagadeesh
5	20241D2005	BOODIDA RAKESH KUMAR	414076	
6	20241D2006	H KARAN KUMAR	414065	H. Karan Kumar
7	20241D2007	JADAV PAVAN KALYAN	414072	
8	20241D2008	JAKKULA SRINIVAS	414036	J. Srinivas
9	20241D2009	JANGA AJAY KUMAR	414056	J. Ajay
10	20241D2010	JANGILI VIDYA SAGAR YADAV	414059	
11	20241D2011	KANDI USHA SRI	414074	K. Usha Sri
12	20241D2012	KOTLA SAI PRAKASH	414068	K. Sai Prakash
13	20241D2013	KOTTE SAI KRISHNA	414071	
14	20241D2014	MADAM SAMKEERTHANA	— ABSENT	
15	20241D2015	MADHIKUNTLA SHIREESHA	414055	Shireesha
16	20241D2016	MALYALA PRIYANKA	414060	Priyanka
17	20241D2017	MANDALA NAVEEN	414067	Naveen
18	20241D2018	CHENNA JHANSI	414070	
19	20241D2019	MOHAMMED YASIR HUSSAIN	414046	
20	20241D2020	NARAPA SIVA BHASKAR REDDY	414061	N Siva
21	20241D2021	POLU SIREESH KUMAR REDDY	414066	
22	20241D2022	SAMA MADHAVI	113119	
23	20241D2023	SHAIK ANSAR AHMED	414048	Ansar
24	20241D2024	PANDRALA SANJANA	414053	Sanjana
25	20241D2025	GUGULOTHU AMRUTHAKALA	414062	
26	20241D2026	JAGANNADHAM ROHITH KUMAR	414063	J. Rohith
27	20241D2027	DAIDA VERONICA PRIYADHARSHINI	414064	
28	20241D2028	ALETI GANESH	414069	Ananth
29	20241D2029	KAKI SAI TULASI PRASANTHI	414075	KP

No of Students Present: 28
No of Students Absent: 01
Total No of Students: 29

Faculty Signature

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Department of Civil Engineering

M.Tech II-I (STE)

ATTENDANCE SHEET

Room No: 4112 MID 1 EXAMINATION **Date:27/12/21 (FN)**

S.No	ROLL NUMBER	NAME OF THE STUDENT	Booklet No	Signature
1	20241D2001	ADUVALA RAJESH KHANNA	394561	
2	20241D2002	DURGAM NISHIPRIYA	394560	
3	20241D2003	ASHALA SHARATH KUMAR 394562	394561	A. Sharath
4	20241D2004	BODDUPALLI JAGADEESH	394563	Jagadeesh
5	20241D2005	BOODIDA RAKESH KUMAR	113117	
6	20241D2006	H KARAN KUMAR	394565	H. Karan Kumar
7	20241D2007	JADAV PAVAN KALYAN	394566	
8	20241D2008	JAKKULA SRINIVAS	394567	J. Srinivas
9	20241D2009	JANGA AJAY KUMAR	394580	J. Ajay
10	20241D2010	JANGILI VIDYA SAGAR YADAV	394571	
11	20241D2011	KANDI USHA SRI	394576	K. Usha Sri
12	20241D2012	KOTLA SAI PRAKASH	394573	K. Prakash
13	20241D2013	KOTTE SAI KRISHNA	394574	
14	20241D2014	MADAM SAMKEERTHANA	394570	Keerthana
15	20241D2015	MADHIKUNTLA SHIREESHA	394581	
16	20241D2016	MALYALA PRIYANKA	394568	Priyanka
17	20241D2017	MANDALA NAVEEN	394569	Naveen
18	20241D2018	CHENNA JHANSI	394570	
19	20241D2019	MOHAMMED YASIR HUSSAIN	394582	
20	20241D2020	NARAPA SIVA BHASKAR REDDY	394583	N. Siva
21	20241D2021	POLU SIREESH KUMAR REDDY	394584	PS
22	20241D2022	SAMA MADHAVI	394585	S. Madhavi
23	20241D2023	SHAIK ANSAR AHMED	394589	Ansar
24	20241D2024	PANDRALA SANJANA	394579	Sanjana
25	20241D2025	GUGULOTHU AMRUTHAKALA	394586	
26	20241D2026	JAGANNADHAM ROHITH KUMAR	394587	J. Rohith
27	20241D2027	DAIDA VERONICA PRIYADHARSHINI	394575	Veronica
28	20241D2028	ALETI GANESH	394588	A. Ganesh
29	20241D2029	KAKI SAI TULASI PRASANTHI	394571	KP

No of Students Present: 29
No of Students Absent: NIL
Total No of Students: 29

Faculty Signature

I. M. Sarada

Gokaraju Rangaraju Institute of Engineering & Technology

M.Tech II Year I Semester STRUCTURAL ENGINEERING

DPSC MID I EXAMINATION

S.No	Roll No	Student Name	Obj(5M)	Sub(15M)	Total(20M)
1	20241D2001	ADUVALA RAJESH KHANNA	3	12	15
2	20241D2002	DURGAM NISHIPRIYA	3	13	16
3	20241D2003	ASHALA SHARATH KUMAR	3	15	18
4	20241D2004	BODDUPALLI JAGADEESH	4	14	18
5	20241D2005	BOODIDA RAKESH KUMAR	3	11	14
6	20241D2006	H KARAN KUMAR	2	4	6
7	20241D2007	JADAV PAVAN KALYAN	3	13	16
8	20241D2008	JAKKULA SRINIVAS	4	13	17
9	20241D2009	JANGA AJAY KUMAR	3	9	12
10	20241D2010	JANGILI VIDYA SAGAR YADAV	3	8	11
11	20241D2011	KANDI USHA SRI	4	6	10
12	20241D2012	KOTLA SAI PRAKASH	3	14	17
13	20241D2013	KOTTE SAI KRISHNA	3	11	14
14	20241D2014	MADAM SAMKEERTHANA	3	11	14
15	20241D2015	MADHIKUNTLA SHIREESHA	3	15	18
16	20241D2016	MALYALA PRIYANKA	2	15	17
17	20241D2017	MANDALA NAVEEN	3	10	13
18	20241D2018	CHENNA JHANSI	2	10	12
19	20241D2019	MOHAMMED YASIR HUSSAIN	4	14	18
20	20241D2020	NARAPA SIVA BHASKAR REDDY	4	15	19
21	20241D2021	POLU SIREESH KUMAR REDDY	3	11	14
22	20241D2022	SAMA MADHAVI	5	14	19
23	20241D2023	SHAIK ANSAR AHMED	5	15	20
24	20241D2024	PANDRALA SANJANA	4	10	14
25	20241D2025	GUGULOTHU AMRUTHAKALA	4	15	19
26	20241D2026	JAGANNADHAM ROHITH KUMAR	5	14	19
27	20241D2027	DAIDA VERONICA PRIYADHARSHINI	2	14	16
28	20241D2028	ALETI GANESH	5	14	19
29	20241D2029	KAKI SAI TULASI PRASANTHI	2	10	12

Gokaraju Rangaraju Institute of Engineering & Technology

M.Tech II Year I Semester STRUCTURAL ENGINEERING

DPSC MID II EXAMINATION

S.No	Roll No	Student Name	Obj(5M)	Sub(15M)	Total(20M)
1	20241D2001	ADUVALA RAJESH KHANNA	4	11	15
2	20241D2002	DURGAM NISHIPRIYA	2	11	13
3	20241D2003	ASHALA SHARATH KUMAR	2	12	14
4	20241D2004	BODDUPALLI JAGADEESH	1	11	12
5	20241D2005	BOODIDA RAKESH KUMAR	3	14	17
6	20241D2006	H KARAN KUMAR	2	11	13
7	20241D2007	JADAV PAVAN KALYAN	2	9	11
8	20241D2008	JAKKULA SRINIVAS	4	7	11
9	20241D2009	JANGA AJAY KUMAR	4	9	13
10	20241D2010	JANGILI VIDYA SAGAR YADAV	2	7	9
11	20241D2011	KANDI USHA SRI	3	11	14
12	20241D2012	KOTLA SAI PRAKASH	2	8	10
13	20241D2013	KOTTE SAI KRISHNA	2	12	14
14	20241D2014	MADAM SAMKEERTHANA	AB		
15	20241D2015	MADHIKUNTLA SHIREESHA	3	15	18
16	20241D2016	MALYALA PRIYANKA	1	13	14
17	20241D2017	MANDALA NAVEEN	2	8	10
18	20241D2018	CHENNA JHANSI	2	11	13
19	20241D2019	MOHAMMED YASIR HUSSAIN	2	12	14
20	20241D2020	NARAPA SIVA BHASKAR REDDY	3	13	16
21	20241D2021	POLU SIREESH KUMAR REDDY	3	13	16
22	20241D2022	SAMA MADHAVI	1	12	13
23	20241D2023	SHAIK ANSAR AHMED	3	13	16
24	20241D2024	PANDRALA SANJANA	1	12	13
25	20241D2025	GUGULOTHU AMRUTHAKALA	2	12	14
26	20241D2026	JAGANNADHAM ROHITH KUMAR	2	12	14
27	20241D2027	DAIDA VERONICA PRIYADHARSHINI	2	14	16
28	20241D2028	ALETI GANESH	2	12	14
29	20241D2029	KAKI SAI TULASI PRASANTHI	3	13	16

Gokaraju Rangaraju Institute of Engineering & Technology

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Bachupally, Kukatpally, Hyderabad - 500090

I II **MID TERM EXAMINATION**

No. 394586

H.T. No.	2	0	2	4	1	D	2	0	2	5

Name of the Examination IInd year M.tech 1st mid Examination.

Course Prestressed concrete Branch STE Date 27/12/21

M. Sarada
Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS	5		2½				5		1		5		15/15

START WRITING FROM HERE

(1)

B = 120mm

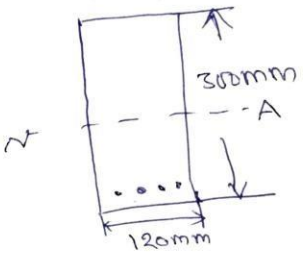
D = 300mm.

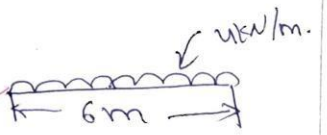
Span (l) = 6m = 6000mm.

Wudl = uKN/m.

P = 180×10^3 N/mm².

e = 50mm.





⇒ Prestressing force (direct)

$$\frac{P}{A} = \frac{180 \times 10^3}{120 \times 300} = 5 \text{ N/mm}^2$$

* $\frac{Pe}{z} = \frac{180\times10^3\times50}{\frac{bd^2}{6}}$

$z = \frac{b.d^2}{6}$

$z = \frac{120\times300^2}{6} = 1.8\times10^6$ mm³

* $\frac{Pe}{z} = \frac{180\times10^3\times50}{1.8\times10^6} = 5\ N/mm^2$.

* Moment : at central line :

$M = \frac{wl^2}{8} = \frac{4\times6000^2}{8} = 18$ N.mm

* $\frac{M}{z} = \frac{18\times10^6}{1.8\times10^6} = 10$ N.mm².

* Resultant stress :

$\frac{P}{A} + \frac{Pe}{z} + \frac{M}{z}$ at top.

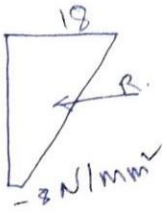
at bottom → $\frac{P}{A} + \frac{Pe}{z} - \frac{M}{z}$

* $5 - 5 + 18 = 18\ N/mm^2$

*

* At bottom →

$$5 + 5 - 18 = -8 \ N/mm^2.$$



$$\frac{M}{P} = \frac{18 \times 10^6}{180 \times 10^3} = 100 \ N.mm^2$$

⇒ moment at quater position of section :-

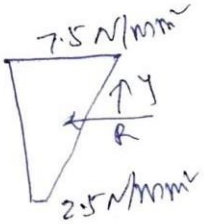
$$* \ M = \frac{3wl^2}{32}$$

$$M = \frac{3 \times 4 \times 6600^2}{32} = 13.5 \times 10^6 \ N.mm.$$

$$* \ \frac{M}{Z} = \frac{13.5 \times 10^6}{1.8 \times 10^6} = 7.5 \ N/mm^2.$$

* Resultant Stresses :-

* At top :- $\frac{P}{A} - \frac{Pe}{Z} + \frac{M}{Z}$



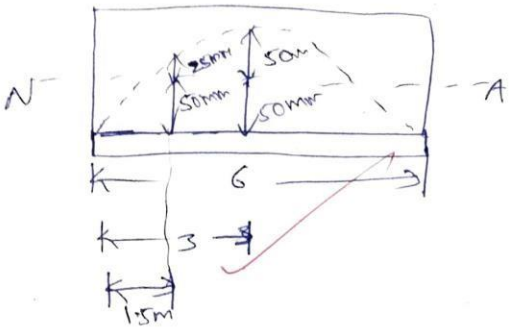
$$5 - 5 + 7.5 = 7.5 \ N/mm^2$$

* At bottom ⇒

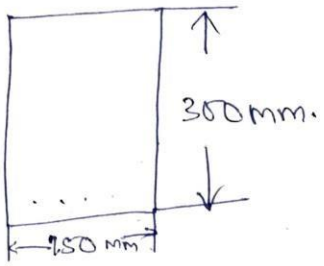
$$5 + 5 - 7.5 = 2.5 \ N/mm^2$$

* $\frac{M}{P} = \frac{13.5 \times 10^6}{180 \times 10^3} = 75$

$e = 25mm$



(4)



Given data:-

$B = 150mm$

$D = 300mm.$, $d = 250mm.$

shear force $V = 130KN.$

$f_{cp} = 5 N/mm^2.$

* $f_y = 415\ N/mm^2$

* $f_{ck} = 40\ N/mm^2$

* effective cover = 50mm.

$\Rightarrow$ $V_{co} = 0.67 b D \sqrt{(f_t^2 + 0.8 f_{cp} f_t)}$

$f_t = 0.24 \sqrt{f_{ck}}$

$f_t = 0.24 \times \sqrt{40}$

$f_t = 1.5178\ mm^2$

$V_{co} = 0.67 \times 150 \times 300 \sqrt{(1.517)^2 + 0.8 \times 5 \times (1.517)}$

$V_{co} = 30150 \sqrt{\ }$

$V_{co} = 87.22 \times 10^3\ N.mm^2$.

$V_{co} < V$

$87.22kN < 130kN$.

* when $V_{co} < V$, shear reinforcement shall be provided.

$$\frac{Asv}{Sv} = \frac{V - Vc}{0.87 f_y d_t}$$

$$Asv = 2 \times \frac{\pi}{4} \times d^2$$

∴ Provide 8mm diameter in two stepped stirrups.

$$Asv = 2 \times \frac{\pi}{4} \times 8^2$$

$$= 100.530 mm^2.$$

$$Sv = \frac{0.87 f_y Asv d_t}{V - Vc}$$

$$Sv = \frac{0.87 \times 415 \times 250 \times 100.53}{150 - 87.22}$$

$$Sv = 144.537 \times 10^3 \ N/mm^2.$$

∴ Spacing of stirrups = $0.7 d_t$ (or) 4x web thick.

$$= 0.7 \times 250 = 175 mm.$$

V exceed $= 1.8 Vc$

$$= 1.8 \times 87.22 = 156.99$$

then reduced 0.5 dt

$= 0.5 \times 250 = 125\ mm$ //

(6) Given data:-

B = 200mm.

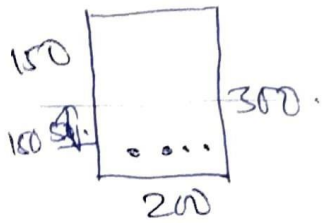
D = 300mm.

Area = 320mm².

e = 50mm.

$E_s = 210 N/mm^2$

$E_c = 35 N/mm^2$.



- Relaxation of stress in steel = 5% of initial stress.
- Shrinkage of concrete = 300×10^{-6} for pre-tensioning

  Post tensioning = 200×10^{-6}.
- Creep coefficient = 1.6.
- Slip anchorage is = 1mm.

* Prestressing force = A × f_p

= 320 × 1000

P = 320 kN.

* $I = \frac{bd^3}{12} = \frac{200 \times 300^3}{12} = 450 \times 10^6 \, N/mm^2$.

* $y = \frac{d}{2} = \frac{300}{2} = 150mm$.

* $Z = \frac{bd^2}{6} = \frac{200 \times 300^2}{6} = 3 \times 10^6$.

* $M = \frac{wl^2}{8} = \frac{320 \times 10^3 \times 1000^2}{8} = 4 \times 10^{10} \, N/mm^2$.

⇒ losses of Prestress

* Elastic deformation

Pretension

$\left(\frac{E_s}{E_c}\right) \times f_c$

$= \left(\frac{210}{35}\right) \times f_c$.

Post tension

—

—

$f_c = \frac{P}{A} + \frac{M_b e}{I} + \frac{M_{be} e}{I}$

$$= \frac{320\times10^3}{200\times300} + \frac{4\times10^{10}\times450}{450\times10^6} + \frac{4\times10^{10}\times50\times50}{450\times10^6} = 285\ N/mm^2$$

$$= 0.79\ N/mm^2$$

$$* \frac{Pe}{Z} = \frac{320\times10^3\times50}{3\times10^6} = 5.33\ N/mm^2$$

① ⇒ Elastic deformation in pre-tensioning $= \left(\frac{210}{35}\right)\times0.79$

$= 22.74\ N/mm^2$

Post tensioning → No losses (–)

② Relaxation of stress in steel $= 5\% \times 1000$

Pre & Post tensioning $= 50\ N/mm^2$

③ Shrinkage of concrete in pre-tensioning

$= 300\times10^{-6}\times210\times10^6 = 63\times10^3\ N/mm^2$

for post tensioning $= 200\times10^{-6}\times210\times10^6 = 42\times10^3\ N/mm^2$

④ creep coefficient $= 1.6\times22.79 = 36.4\ N/mm^2$.
(pre tension)

⑤ Slip anchorage $= \frac{1}{10\times10^3}\times100 = 0.01\ N/mm^2$

⑥ total loss of stress = Pre tensioning

$= 172.14\ N/mm^2$.

* total loss of Prestress in post tensioning = 128.41 N/mm²

⇒ Percentage of Pre-tension loss of stress = 17.2 %

⇒ Percentage of Post-tension loss of stress = 12.9 %

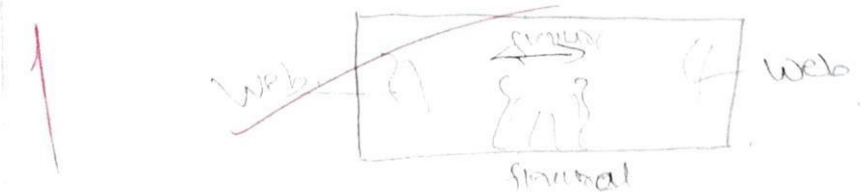
(2) (a) Distinguish between pre and post tensioned members.

Pre-tension	Post-tension
* In a Pre-tensioned in which the tendons are tensioned before concreting.	* In a post-tensioned A method of Prestressing concrete in which prestressing steel is tensioned against the harden concrete.
* The ultimate of bond.	* the ultimate load on no bonding not bond.
* The Prestressing is a used for	

Shorter spans like current poles	* In post tensioning are used for longer span bridges.
* In pre-tensioned has a more losses compare to post-tension.	* In post-tensioned has a less losses compared to pre-tension.
* In a pre-tensioned the cable wires are in straight line. It can be placed in Inclined or curve but is is difficult.	* In post-tensioned the wires are placing so much easy compare to pre-tensioning.

5a) * They are two types of cracks.

a) web crack b) shear crack.



* web cracks are the interior part and shear cracks are the Inclied part.
* The cracks are placed in inclined
* The flexure crack is a become of flexural cracks.

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Bachupally, Kukatpally, Hyderabad - 500090

I | II **MID TERM EXAMINATION**

No. 414047 H.T. No. 2 0 2 4 1 D 2 0 1 8

Name of the Examination II M.Tech I sem 1st MiD

Course DPSC Branch Structual Engg Date 23/2/2022

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS	2				4						4		10/15

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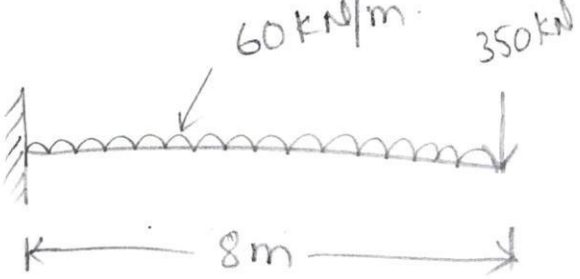
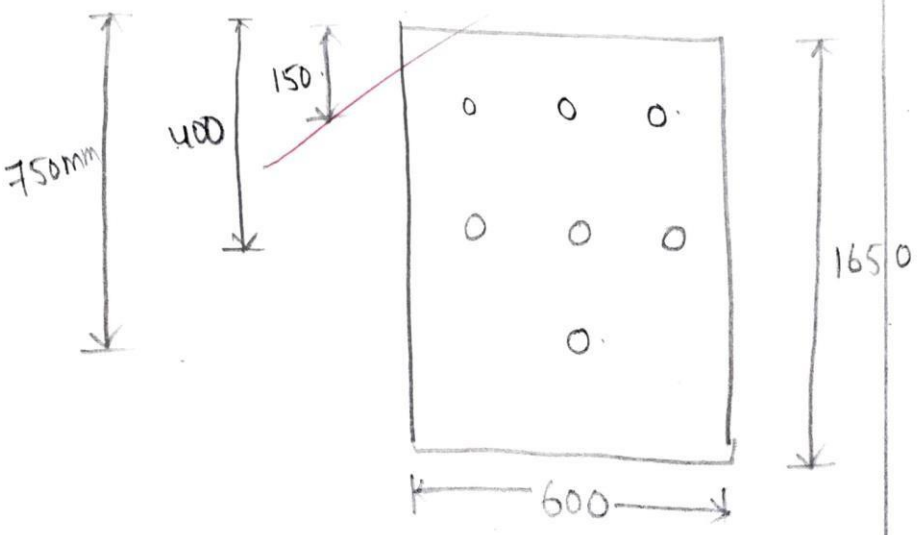
3) Given data,

prestressed force = 1000 kN.





$$= \frac{750 \times 1 + 400 \times 3 + 150 \times 3}{750 + 400 + 150} \quad 1 + 3 + 3$$

$$= 342.85 \text{ mm} \approx 343 \text{ mm}.$$

$$\Rightarrow 825 - 343 \Rightarrow 482 \text{ mm}.$$

$$\sigma = \frac{P}{A} + \frac{Pey}{I} - \frac{M}{I}.$$

prestressed force = ~~P x e~~ 1350 * 7

$$= 7000 \text{ KN}.$$

$$M = 350 \times 8 + \frac{60 \times 8^2}{2}$$

$$= 4720 \text{ KN.m}$$

$$\sigma = \frac{7000 \times 10^3}{600 \times 825} + \frac{7000 \times 482 \times 412.5 \times 10^3}{\frac{600 \times 825^3}{12}}$$

$$- \frac{4720 \times 1 \times 10^3}{\frac{600 \times 825^3}{12}}$$

$$\sigma = 63.71 \text{ N/mm}^2$$

$$\tau = \frac{VA\bar{y}}{I.b}$$

$$V = 350 + 60 \times 8.$$

$$= 830 \text{ kN}.$$

$$\tau = \frac{830 \times 10^3 \times 600 \times 825 \times \left[350 + \frac{550}{2}\right]}{\frac{600 \times 825^3}{12} \times 600}$$

$$= 15.24 \text{ N/mm}^2$$

$$\text{principal stresses} = \frac{\sigma}{2} \pm \sqrt{\sigma^2 + 4\tau^2}$$

$$= \frac{63.71}{2} \pm \sqrt{63.71^2 + 4 \times 15.24^2}$$

$$= 102.48 \text{ N/mm}^2$$

$$= -38.77 \text{ N/mm}^2$$

Max. principal stress = 102.48 MPa

Min. principal stress = −38.77 MPa

6) Given data

Area of wire = $320\ mm^2$

$e = 50\ mm$

Intial stress = $1000\ N/mm^2$

$\therefore L = 10\ mm$

$E_s = 210\ kN/mm^2$

Assume $E_c = 200\ kN/mm^2$

Relaxation of stress = 5 % of intial stress

$\varepsilon_s = 300 \times 10^{-6}$ for pre tensioning

$\varepsilon_s = 200 \times 10^{-6}$ for post tensioning

$\phi = 1.6$

Slip at anchorage = 1 mm

Losses of prestress	pre tensioning	post tensioning
Elastic deformation of steel	$\frac{E_s}{E_c} \times f_c$. $\Rightarrow 11.2$	—
Relaxation of steel	5% of I.S 50	50

Creep of concrete	$\phi_c \times \frac{E_s}{E_c} \times f_c$ $\Rightarrow$ 17.92	17.92
shrinkage	$\varepsilon_s \times E_s$ $\Rightarrow$ 63.	42.
Slip at anchorage	—	$\frac{1}{10 \times 10^3} \times 210 \times 10^3$ $\Rightarrow$ 21
Total loss of prestress	142.12	130.92
% total loss of prestress	14.21 %	13.9 %

$$f_c = \frac{P}{A} + \frac{Pey}{I}$$

P = Area x Intial stress

$= 320 \times 1000$

$= 320 \times 10^3$ ~~KN~~.

$$f_c = \frac{320 \times 10^3}{200 \times 300} + \frac{320 \times 10^3 \times 50 \times 150}{\frac{200 \times 300^3}{12}}$$

$f_c = 10.67 \ N/mm^2$

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H. Karan Kumar

I	II	MID TERM EXAMINATION

No. 394565

H.T. No.	2	0	2	4	1	D	2	0	0	6

Name of the Examination Design of Prestressed concrete

Course II M'TECH I semester Branch Structural Engg. Date 24/12/2021

M. Sarada

Signature of the Invigilator

Q.NO.	1		2		3		4		5		6		TOTAL
	a	b	a	b	a	b	a	b	a	b	a	b	
MARKS							1				3		4

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H.

Given data

$b = 150\ mm$

$d = 300mm$

$V = 130\ kN$

$f_{ck} = 40\ mm$

$f_y = 415$

$f_{cp} = 5N/mm^2$

6.

$b = 200mm$

$d = 300mm$

$E_s = 210 \text{ N/mm}^2$

$A = 200 \times 300$
$= 6 \times 10^3$

$f_c = 35$

$e = 50mm$

Relaxation of stress in steel = 5 %.

Shrinkage of concrete for

Pre tensioning 300×10^{-6}

Post tensioning 200×10^{-6}

Creep co-efficient = 1.6.

slip at anchorage = 1mm

Prestressing force 320×1000

$P = 320 \text{ kN}$

stress in concrete at level of steel

$$f_c = \frac{P}{A} + \frac{Pey}{I}$$

$$= \frac{320}{6 \times 10^3} + \frac{320 \times 50 \times 50}{\left(\frac{200 \times 300^3}{12}\right)}$$

$$f_c = 3.8 \text{ N/mm}^2$$

loeses of stress

	Pre	Post
elastic deformation of concrete.	$\frac{E_s}{E_c} \times f_c$ $= \frac{210}{35} \times 8.8$ $= 22.8$	—
relaxation of stress	0.05×1000 $= 50$	50.
shrinkage of concrete	$300 \times 10^{-6} \times 210 \times 10^6$ $= 6.3 \times 10^8$	$200 \times 10^{-6} \times 210 \times 10^6$ $= 4.2 \times 10^8$
Creep co-efficient	1.6×22.8 $= 36.48$	
anchorage		$\frac{1}{10 \times 10^3} \times 210 \times 10^3 = 21$
total loss of stresses	172.28	149.48
% of loss	17.23%	14.95%.

2024ID2022
S. Madhavi

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

(Autonomous)

II M.Tech I Semester Mid- I Examinations

DESIGN OF PRESTRESSED CONCRETE

(Structural Engineering)

42/5

OBJECTIVE

Multiple Choice Questions (MCQs)

(Answer ALL questions. All questions carry equal marks)

Time: 15 Minutes $10 * {}^{1}/_{2} = 5$ **Marks**

1	Loss of stress due to elastic deformation of concrete depends upon (a) Relaxation of Steel (b) Friction and Anchorage Slip (c) Modular Ratio (d) None	[C]
2	Loss of stress due to friction depends upon (a) Modulus of Elasticity of Concrete (b) Coefficient of Friction (c) Relaxation of Steel (d) All the above	[b]
3	Horizontal or axial prestressingof concrete beams (a) Reduces the shear strength of the member (b) Has no effect on the shear strength (c) Increases the shear strength (d) All the above	[C]
4	Ultimate shear strength of prestressed beams failing due to flexure-shear cracks isinfluenced by (a) The width of the section (b) Effective prestress after all loses (c) Tensile strength of concrete (d) Shear strength of concrete.	[b]
5	The ideal cross-section recommended to resist shear and torsion in bridge girders is (a) Rectangular (b) Tee (c) Hollow box (d) I section	[a]
6	Eccentric tendons in a concrete beam section induce (a) Only direct stress (b) Only bending stress (c) Direct and bending stress (d) Only Shear stress	[C]
7	Uniformly distributed load on a concrete beam can be effectively counter balancedby selecting (a) a Concentric cable (b) an Eccentric cable (c) a Parabolic cable (d) a Trapezoidal cable	[C]
8	Resultant stress in the cross-section of a prestressed beam comprises of (a) Prestress + Dead-Load stress + Live-Load stress (b) Prestress + Dead-Load stress (c) Prestress + Live-Load stress (d) Dead Load + Live Load	[a]
9	At the end face of a pretensioned beam the tensile stress in steel is (a) Maximum (b) Zero (c) Minimum (d) Cannot define	[b]
10	At a distance equal to the transmission length from the end face of a pretensioned beam, the force in the tendon is (a) Zero (b) 50 per cent of the initial prestressing force (c) Equal to the initial prestressing force (d) 75 per cent of the initial prestressing force	[b]

A. Sharath Kumar
2021D2003

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

(Autonomous)

II M.Tech I Semester Mid- I Examinations

A. Sharath

DESIGN OF PRESTRESSED CONCRETE

(Structural Engineering)

OBJECTIVE

Multiple Choice Questions (MCQs)

(Answer ALL questions. All questions carry equal marks)

Time: 15 Minutes **10 * ½ = 5 Marks**

1	Loss of stress due to elastic deformation of concrete depends upon (a) Relaxation of Steel (b) Friction and Anchorage Slip (c) Modular Ratio (d) None	[a]
2	Loss of stress due to friction depends upon (a) Modulus of Elasticity of Concrete (b) Coefficient of Friction (c) Relaxation of Steel (d) All the above	[b]
3	Horizontal or axial prestressingof concrete beams (a) Reduces the shear strength of the member (b) Has no effect on the shear strength (c) Increases the shear strength (d) All the above	[b]
4	Ultimate shear strength of prestressed beams failing due to flexure-shear cracks isinfluenced by (a) The width of the section (b) Effective prestress after all loses (c) Tensile strength of concrete (d) Shear strength of concrete.	[c]
5	The ideal cross-section recommended to resist shear and torsion in bridge girders is (a) Rectangular (b) Tee (c) Hollow box (d) I section	[a]
6	Eccentric tendons in a concrete beam section induce (a) Only direct stress (b) Only bending stress (c) Direct and bending stress (d) Only Shear stress	[c]
7	Uniformly distributed load on a concrete beam can be effectively counter balancedby selecting (a) a Concentric cable (b) an Eccentric cable (c) a Parabolic cable (d) a Trapezoidal cable	[a]
8	Resultant stress in the cross-section of a prestressed beam comprises of (a) Prestress + Dead-Load stress + Live-Load stress (b) Prestress + Dead-Load stress (c) Prestress + Live-Load stress (d) Dead Load + Live Load	[a]
9	At the end face of a pretensioned beam the tensile stress in steel is (a) Maximum (b) Zero (c) Minimum (d) Cannot define	[a]
10	At a distance equal to the transmission length from the end face of a pretensioned beam, the force in the tendon is (a) Zero (b) 50 per cent of the initial prestressing force (c) Equal to the initial prestressing force (d) 75 per cent of the initial prestressing force	[c]

K. Prashanthi

2024102029

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY

(Autonomous)

II M.Tech I Semester Mid- I Examinations

K. Prashanthi

DESIGN OF PRESTRESSED CONCRETE

(Structural Engineering)

OBJECTIVE

Multiple Choice Questions (MCQs)

(Answer ALL questions. All questions carry equal marks)

Time: 15 Minutes **10 * $^1/_2$ = 5 Marks**

1	Loss of stress due to elastic deformation of concrete depends upon (a) Relaxation of Steel (b) Friction and Anchorage Slip (c) Modular Ratio (d) None	[A]
2	Loss of stress due to friction depends upon (a) Modulus of Elasticity of Concrete (b) Coefficient of Friction (c) Relaxation of Steel (d) All the above	[D]
3	Horizontal or axial prestressingof concrete beams (a) Reduces the shear strength of the member (b) Has no effect on the shear strength (c) Increases the shear strength (d) All the above	[A]
4	Ultimate shear strength of prestressed beams failing due to flexure-shear cracks isinfluenced by (a) The width of the section (b) Effective prestress after all loses (c) Tensile strength of concrete (d) Shear strength of concrete.	[D]
5	The ideal cross-section recommended to resist shear and torsion in bridge girders is (a) Rectangular (b) Tee (c) Hollow box (d) I section	[A]
6	Eccentric tendons in a concrete beam section induce (a) Only direct stress (b) Only bending stress (c) Direct and bending stress (d) Only Shear stress	[A]
7	Uniformly distributed load on a concrete beam can be effectively counter balancedby selecting (a) a Concentric cable (b) an Eccentric cable (c) a Parabolic cable (d) a Trapezoidal cable	[A]
8	Resultant stress in the cross-section of a prestressed beam comprises of (a) Prestress + Dead-Load stress + Live-Load stress (b) Prestress + Dead-Load stress (c) Prestress + Live-Load stress (d) Dead Load + Live Load	[B]
9	At the end face of a pretensioned beam the tensile stress in steel is (a) Maximum (b) Zero (c) Minimum (d) Cannot define	[C]
10	At a distance equal to the transmission length from the end face of a pretensioned beam, the force in the tendon is (a) Zero (b) 50 per cent of the initial prestressing force (c) Equal to the initial prestressing force (d) 75 per cent of the initial prestressing force	[D]

CODE: GR20D5022 | GR 20 | SET - 1

M.Tech II Year I Semester Regular Examinations, March 2022

DESIGN OF PRESTRESSED CONCRETE
(Structural Engineering)

Time: 3 hours **Max Marks: 70**

Instructions:

1. Question paper comprises of **Part-A** and **Part-B**
2. **Part-A** (for 20 marks) must be answered at one place in the answer book.
3. **Part-B** (for 50 marks) consists of **five questions with internal choice,** answer all questions.

PART – A
(Answer ALL questions. All questions carry equal marks)

10 * 2 = 20 Marks

1. a.	Explain the principle of prestressing.	[2]
b.	What are the advantages of prestressed concrete?	[2]
c.	What is curvature effect?	[2]
d.	Explain the effect of torsion on prestressed concrete sections.	[2]
e.	State the assumptions made in the analysis of prestressed concrete flexural members	[2]
f.	What are the various methods generally used for the investigation of anchorage zone stressed?	[2]
g.	Explain about concordancy.	[2]
h.	What are cap cables and where are they used?	[2]
i.	What is the influence of differential shrinkage on composite prestressed concrete members?	[2]
j.	List the commonly used method to analyse secondary moments in prestressed concrete continuous members.	[2]

PART – B
(Answer ALL questions. All questions carry equal marks)

5 * 10 = 50 Marks

2.	A prestressed concrete beam supports a live load of 4kN/m over a simply supported span of 8m. The beam has an I-section with an overall depth of 400mm. The thickness of the flange and web are 60 and 80mm, respectively. The width of the flange is 200mm. They beam is to be prestressed by an effective prestressing force of 235kN at a suitable eccentricity such that the resultant stress at the soffit of the beam at the centre of the span is zero. Find the eccentricity required for the force.If the tendon is concentric, what should be the magnitude of the prestressing force for the resultant stress to be zero at the bottom fiber of the central span section.	[10]

OR

3. (a) Explain the limitations of prestressed concrete. [10]

(b) A prestress concrete beam spanning over 8m is of rectangular section, 150mm wide and 300mm deep. The beam is prestressed by a parabolic cable having an eccentricity of 75mm below the centroidal axis at centre of span and an eccentricity of 25mm above the centroidal axis at the support sections. The initial force in the cable s 350kN. The beam supports three concentrated loads of 10kN each at intervals of 2m. E_c= 38kN/mm^2.Neglecting losses of prestress, estimate the short-term deflection due to (prestress+ self weight); and Allowing for 20% loss in prestress, estimate the long-term deflection under (prestress+ self weight+ live load), assuming creep coefficient as 1.80.

4. A PSC beam of effective span 15m is of rectangular section 500mm wide and 1000mm deep. A tendons consist of 3600mm^2 of strands of characteristic strength 1700 N/mm^2 with an effective prestress of 910 N/mm^2 . The strands are located 870mm from the top face of the beam. If f_{cu} =60 N/mm^2 , estimate the flexural strength of the section as per BS provisions for the following cases: (i) Bonded tendons (ii) Unbonded tendons. [10]

OR

5. **(a)** Explain the various losses of prestress in post-tensioned members. [10]

(b) A prestressed girder of rectangular section 150 mm wide and 300 mm deep, is to be designed to support an ultimate shear force of 130 kN. The uniform prestress across the section is 5 N/mm^2. Design the suitable spacing for the stirrups as per IS1343-2012. Take Fe415, M40 and an effective cover as 50 mm.

6. A high-tensile cable comprising 12 strands of 15 mm diameter (12K15 of PSC Freyssinet system) with an effective force of 2500 kN is anchored concentrically in an end block of a post- tensioned beam. The end block is 400 mm wide by 800 mm deep and the anchor plate is 200 mm wide by 260 mm deep. Design suitable anchorage zone reinforcements using Fe-415 grade HYSD bars using IS:1343 code provisions. [10]

OR

7. Design an I-section for a simply supported post-tensioned concrete beam of span 18 m subjected to an imposed load of 25 kN/m over its entire span. The permissible tensile stress in steel is 1250 N/mm^2 and the permissible stresses in concrete are: At transfer: 20 N/mm^2 (Compression) and 2.5 N/mm^2 (Tensile). At working load: 15 N/mm^2 (Compression) and 1.5 N/mm^2 (Tensile). [10]

8. A prestressing force of 400 kN is to be transmitted through a distribution plate 200 mm × 150 mm, the centre of which is located at 150 mm from the bottom of an end block of section 200 mm × 400 mm. Determine the position and magnitude of maximum tensile stress on a horizontal section passing through the centre of the distribution plate. [10]

OR

9. A continuous prestressed concrete beam ABC (AB = BC = 10 m) has a uniform rectangular cross-section with a width of 100 mm and depth of 300 mm. The cable carrying an effective prestressing force of 360 kN is parallel to the axis of the beam and located at 100 mm from the soffit. [10]

(i) Determine the secondary and resultant moment at the central support B.

(ii) If the beam supports an imposed load of 1.5 kN/m, calculate the resultant stresses at top and bottom of the beam at B. Assume density of concrete as 24 kN/m^3.

10. A simply supported pre-tensioned concrete beam of cross-section 200 mm× 350 mm has an effective span of 8 m, is prestressed by tendons with their centroid is 150 mm from the bottom of the beam. The initial prestressing force in tendons is 400 kN. The beam is incorporated in a composite T-beam by casting a top flange of width 450 mm and thickness 60 mm. If the composite beam is subjected to a live load of 15 kN/m^2, determine the resultant stresses developed in the precast and cast-in-situ concrete assuming the pre-tensioned beam is propped. Adopt the loss of prestress as 20% and the modulus of elasticity of concrete in precast and cast-in-situ is the same. [10]

OR

11. A two-span continuous concrete beam ABC (AB=BC=12 m) has a rectangular section, 300 mm wide & 800 mm deep. The beam is prestressed by a cable carrying an effective force of 700 kN. The cable has a linear profile in the span AB & parabolic profile in span BC. The eccentricities of the cable are +50 mm at A, -100 mm at a distance of 7 m from A & +200 mm at support B & -200 mm at mid span of BC (- below and + above centroidal axis). Sketch the line of thrust in the beam if it supports a uniformly distributed load of 5 KN/m which includes the self-weight of the beam. Find the resultant stress distribution at the mid- support section. [10]

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