CE611PE: PRESTRESSED CONCRETE (Professional Elective – II)

COURSE PLANNER

I. COURSEOVERVIEW:

Prestressed concrete is a form of concrete used in construction. It is substantially "prestressed" (compressed) during production, in a manner that strengthens it against tensile forces which will exist when in service.Prestressed concrete is used in a wide range of building and civil structures where its improved performance can allow for longer spans, reduced structural thicknesses, and material savings compared with simple reinforced concrete. Typical applications include high-rise buildings, residential slabs, foundation
systems, bridge and dam structures, silos and tanks, industrial pavements and nuclear containment structures

II. PREREQUISITE(S):

Level	Credits	Periods	Prerequisite
UG	4	4	Engineering Mechanics, soil mechanics

III. COURSEOBJECTIVES:

The course should enable the students to:

1.	To Plan Soil exploration programme for civil EngineeringProjects
2.	To check the stability ofslopes.
3.	To determine the lateral earth pressures and design retainingwalls
4.	To determine the Bearing capacity of Soil
5.	To design pile groupfoundation.

IV. COURSEOUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

Course Outcomes	Description	Bloom's Taxonomy Levels	Program Outcomes, Program Specific Outcomes
CO1	Understand the principles and methods of Geotechnical Exploration	L3: Applying	PO1,PO2,PO3,PSO1, PSO3
CO2	Decide the suitability of soils and check the stability of slopes	L2:Understand, L4: Analyzing	PO2,PO3,PO4,PO6, PSO1.
CO3	Calculate lateral earth pressures and check the stability of retaining walls	Understand, applying	PO1,PO2,PO3,PSO1, PSO3
CO4	Analyse and design the shallow and deep foundations	design	PO1,PO2,PO3,PSO1, PSO3

V. HOW PROGRAM OUTCOMES AREASSESSED:

Program outcomes		Level	Proficiency assessed by
PO1	**Engineering knowledge**: To Apply the knowledge of mathematics, science, engineeringfundamentals/principals, and civil engineering to the solution of complex engineering problems encountered in modern engineering practice.	1	Assignments
PO2	**Problem analysis**: Ability to Identify, formulate, review research literature,andanalyzecomplexengineeringproblemsrelatedtoCivil Engineering andreaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2.5	Exercise, Exams
PO3	**Design/development of solutions**: Design solutions for complex engineeringproblemsrelatedtoCivilEngineeringanddesignsystem components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmentalconsiderations.	3	Exercise
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	1	Discussion, Seminars
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques,resources,andmodernengineeringandITtoolsincluding predictionandmodelingtocomplexengineeringactivitieswithan understanding of the limitations.	-	Discussion, Seminars
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Civil Engineering professional engineering practice.	1	Discussions
PO7	**Environment and sustainability**: Understand the impact of the Civil Engineeringprofessional engineering solutionsin societal and environmentalcontexts,anddemonstratetheknowledgeof,andneed for sustainable development.	-	------
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms ofthe engineering practice.	-	------
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.	-	------
PO10	**Communication**:Communicateeffectivelyoncomplexengineering activities with the engineeringcommunity and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clearinstructions.	-	------

PO11	**Project management and finance**: Demonstrate knowledge and understanding of theengineering and management principles and applythesetoone'sown work,asamemberandleaderinateam,to manage projects and in multidisciplinaryenvironments.	-	-----
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.	-	Prototype, Discussions

VI. HOW PROGRAM SPECIFIC OUTCOMES AREASSESSED:

Program outcomes		Level	Proficiency assessed by
PSO 1	**ENGINEERINGKNOWLEDGE:**Graduates will be able to apply technical knowledge in drawing, analysis, design, laboratory investigations and construction aspects of civilengineering infrastructure, along with good basics in mathematics, basic sciences and technical communication.	2.5	Lectures and Assignments
PSO 2	**BROADNESS AND DIVERSITY:**Graduates will be able to summarize and can demonstrate about societal, economical, environmental, health and safety factors involved in infrastructural development, and shall work within multidisciplinary teams with competence in modern tool usage.	-	Tutorials
PSO 3	**SELF-LEARNING AND SERVICE:**Graduates will be able to pursue lifelong learning and professional development to face the challenging and emerging needs of our society, ethically and responsibly.	1	Seminars and Projects

0-None **2 -Supportive** **3 – Highly Related**

VII. SYLLABUS:

- **UNIT I:**
  Introduction: Historic development- General principles of prestressing pretensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC.Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics.
- **UNIT II:**
  Methods and Systems of prestressing: Pretensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall SystemLee McCall system.Losses of Prestress: Loss of prestress in pretensioned and posttesnioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, slip in anchorage, frictional losses.
- **UNIT III:**
  Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and

beams of rectangular and I sections- Kern line – Cable profile and cable layout.
Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear – Design of shear reinforcements- IS Code provisions.

- **UNIT IV:**
  Transfer of Prestress in Pretensioned Members: Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions
- **UNIT V:**
  Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential
  shrinkage- Analysis of composite beams- General design considerations. Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

REFERENCES:

- 1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book – Co. New Delhi.
- 2. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, New York.
- 3. Prestressed concrete by S. Ramamrutham Dhanpat Rai & Sons, Delhi.
- 4. Prestressed Concrete by N. Rajagopalan Narosa Publishing House

VIII. COURSE PLAN:

Lecture No.	Unit No.	Topics to be covered	Link for PPT	Link for PDF	Course learning outcomes	Teaching Methodology	Reference
1	1	**Unit 1 Introduction:** Historic development	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	**Unit 1 Introduction: TO know** Historic development	DIGITAL WRITING PAD AND WEBCAM	
2	1	General principles of prestressing	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	to develop General principles of prestressing	DIGITAL WRITING PAD AND WEBCAM	
3	1	pretensioning and post tensioning	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know pretensioning and post tensioning	DIGITAL WRITING PAD AND WEBCAM	

4	**1**	Advantages and limitations of Prestressed concrete	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Advantages and limitations of Prestressed concrete	DIGITAL WRITING PAD AND WEBCAM	
5	**1**	General principles of PSC	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know General principles of PSC	DIGITAL WRITING PAD AND WEBCAM	
6	**1**	Classification and types of prestressing-	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Classification and types of prestressing-	DIGITAL WRITING PAD AND WEBCAM	
7	**1**	Materials- high strength concrete and high tensile steel their characteristics.	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Materials- high strength concrete and high tensile steel their characteristics.	DIGITAL WRITING PAD AND WEBCAM	
8	**1**	Materials- high strength concrete and high tensile steel their characteristics.	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Materials- high strength concrete and high tensile steel their characteristics.	DIGITAL WRITING PAD AND WEBCAM	
10	**1**	**Unit 2** Materials- high strength concrete and high tensile steel their characteristics.	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To learn Materials- high strength concrete and high tensile steel their characteristics.	DIGITAL WRITING PAD AND WEBCAM	
11	**2**	**Methods and Systems of prestressing**	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/14_F-MTWRRUD0dqe9IBrPeQSZoxZtJb2h	**To know Methods and Systems of prestressing**	DIGITAL WRITING PAD AND WEBCAM	
12	**2**	Pretensioning and Posttensioning methods and systems of prestressing	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OV	https://drive.google.com/drive/folders/1ibZ9fiiaq	To know Pretensioning and Posttensioning methods and systems	DIGITAL WRITING PAD AND WEBCAM	

			uX_BVuV7Jhpz6Bpoc	Z8b5OVuX_BVuV7Jhpz6Bpoc	of prestressing		
14	**2**	Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system	DIGITAL WRITING PAD AND WEBCAM	
15	**2**	Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	-	-	To know Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	DIGITAL WRITING PAD AND WEBCAM	
16	**2**	Loss of prestress in pretensioned and posttesnioned members	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	DIGITAL WRITING PAD AND WEBCAM	
18	**2**	Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	DIGITAL WRITING PAD AND WEBCAM	
19	**2**	Loss of prestress in pretensioned and posttesnioned members	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	DIGITAL WRITING PAD AND WEBCAM	
20	**2**	Loss of prestress in pretensioned and posttesnioned members	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	DIGITAL WRITING PAD AND WEBCAM	
22	**2**	Loss of prestress in pretensioned and posttesnioned members	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	DIGITAL WRITING PAD AND WEBCAM	
23	**2**	Loss of prestress in pretensioned and posttesnioned members	https://drive.google.com/drive/folders/1ib	https://drive.google.com/drive/folde	To know Loss of prestress in pretensioned and	DIGITAL WRITING PAD AND	

			Z9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	rs/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	posttesnioned members elastic shortage of concrete	WEBCAM	
24	**2**	Loss of prestress in pretensioned and posttesnioned members	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	DIGITAL WRITING PAD AND WEBCAM	
25	**2**	Loss of prestress in pretensioned and posttesnioned members	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Loss of prestress in pretensioned and posttesnioned members elastic shortage of concrete	DIGITAL WRITING PAD AND WEBCAM	**T1,T2 & T3**
26	**3**	**unit 3**Analysis of sections for flexure- beams prestressed with straight	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/14_F-MTWRRUD0dqe9IBrPeQSZoxZtJb2h	to Analys of sections for flexure- beams prestressed with straight	DIGITAL WRITING PAD AND WEBCAM	
27	**3**	concentric, eccentric, bent and parabolic tendons	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	to Analysconcentric, eccentric, bent and parabolic tendons	DIGITAL WRITING PAD AND WEBCAM	
28	**3**	concentric, eccentric, bent and parabolic tendons	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	to Analys concentric, eccentric, bent and parabolic tendons	DIGITAL WRITING PAD AND WEBCAM	
30	**3**	stress diagrams- Elastic design of PSC slabs	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	to Analysstress diagrams- Elastic design of PSC slabs	DIGITAL WRITING PAD AND WEBCAM	
31	**3**	beams of rectangular and I sections- Kern line	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	to Analys beams of rectangular and I sections- Kern line	DIGITAL WRITING PAD AND WEBCAM	

32	**3**	Cable profile and cable layout.	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	to Analys Cable profile and cable layout.	DIGITAL WRITING PAD AND WEBCAM	
33	**3**	General Considerations- Principal tension and compression	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know General Considerations- Principal tension and compression	DIGITAL WRITING PAD AND WEBCAM	
34	**3**	General Considerations- Principal tension and compression	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know General Considerations- Principal tension and compression	DIGITAL WRITING PAD AND WEBCAM	
35	**3**	Improving shear resistance of concrete by horizontal and vertical prestressing	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Improving shear resistance of concrete by horizontal and vertical prestressing	DIGITAL WRITING PAD AND WEBCAM	
36	3	Improving shear resistance of concrete by horizontal and vertical prestressing	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Improving shear resistance of concrete by horizontal and vertical prestressing	DIGITAL WRITING PAD AND WEBCAM	
37	**3**	inclined or parabolic cables	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know inclined or parabolic cables	DIGITAL WRITING PAD AND WEBCAM	
38	**3**	Analysis of rectangular and I beams for shear	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	Analysis of rectangular and I beams for shear	DIGITAL WRITING PAD AND WEBCAM	
39	**3**	Analysis of rectangular and I beams for shear	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BV	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	Analysis of rectangular and I beams for shear	DIGITAL WRITING PAD AND WEBCAM	

			uV7Jhpz6Bpoc				
40	**3**	Analysis of rectangular and I beams for shear	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	Analysis of rectangular and I beams for shear	DIGITAL WRITING PAD AND WEBCAM	
41	**4**	**Unit 4** Transmission of prestressing force by bond – Transmission length	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/14_F-MTWRRUD0dqe9IBrPeQSZoxZtJb2h	To Learn Transmission of prestressing force by bond – Transmission length	DIGITAL WRITING PAD AND WEBCAM	
42	**4**	Transmission of prestressing force by bond – Transmission length	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To Learn Transmission of prestressing force by bond – Transmission length	DIGITAL WRITING PAD AND WEBCAM	
43	**4**	Flexural bond stresses	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Flexural bond stresses	DIGITAL WRITING PAD AND WEBCAM	
44	**4**	IS code provisions – Anchorage zone stresses in post tensioned members	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know IS code provisions – Anchorage zone stresses in post tensioned members	DIGITAL WRITING PAD AND WEBCAM	
45	**4**	Analysis by Guyon, Magnel, Zienlinski and Rowe's methods	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	To know Analysis by Guyon, Magnel, Zienlinski and Rowe's methods	DIGITAL WRITING PAD AND WEBCAM	
46	**4**	Analysis by Guyon, Magnel, Zienlinski and Rowe's methods	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	Analysis by Guyon, Magnel, Zienlinski and Rowe's methods	DIGITAL WRITING PAD AND WEBCAM	

47	**4**	Anchorage zone reinforcement- IS Provisions	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	Anchorage zone reinforcement- IS Provisions	DIGITAL WRITING PAD AND WEBCAM	
48	**4**	Anchorage zone reinforcement- IS Provisions	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	Anchorage zone reinforcement- IS Provisions	DIGITAL WRITING PAD AND WEBCAM	
49	**4**	Anchorage zone reinforcement- IS Provisions	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc			
50	**4**	Anchorage zone reinforcement- IS Provisions	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	DIGITAL WRITING PAD AND WEBCAM		**T1,T2 & T3**
51	**4**	Anchorage zone reinforcement- IS Provisions			DIGITAL WRITING PAD AND WEBCAM		
52	**5**	**Unit 5** Different Types- Propped and Unpropped- stress distribution	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/14_F-MTWRRUD0dqe9IBrPeQSZoxZtJb2h	DIGITAL WRITING PAD AND WEBCAM		
53	**5**	Differential shrinkage- Analysis of composite beams	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	DIGITAL WRITING PAD AND WEBCAM		
54	**5**	General design considerations	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	DIGITAL WRITING PAD AND WEBCAM		
55	**5**	Importance of control of deflections- Factors influencing deflections	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	DIGITAL WRITING PAD AND WEBCAM		

56	**5**	Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	https://drive.google.com/drive/folders/1ibZ9fiiaqZ8b5OVuX_BVuV7Jhpz6Bpoc	DIGITAL WRITING PAD AND WEBCAM	

IX. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFICOUTCOMES:

Cours e Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
I	2	3	3	-	-	-	-	-	-	-	-	-	2	--	2
II	-	2	3	2	-	2	-	-	-	-	-	-	3	-	-
III	2	2	2	2		2									
IV		2	2	2									3		
Average	2	2.25	2.5	2	-	2	-	-	-	-	-	-	2.5	-	1

0=None 2=Supportive 3=Highlyrelated

X. QUESTION BANK:(JNTUH)

DESCRIPTIVE QUESTIONS: (WITH BLOOMS PHRASES)

UNIT-I

SHORT ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	What are the advantages of PSC construction	Remember	1
2	Define Pre tensioning and Post tensioning	Remember	2
3	What is the need for the use of high strength concrete and tensile steel in Pre stressed concrete?	Remember	2
4	Define Kern Distance	Remember	2
5	What is Relaxation of steel?	Remember	2

6	What is concordant prestressing?	Remember	2
7	Define bonded and non bonded prestressing concrete.	Understand	2
8	Define Axial prestressing	Remember	1
9	Define Prestressed concrete.	Remember	1
10	Define anchorage.	Remember	1

LONG ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	Explain the advantages of prestressed concrete	Understand	1
2	.Explain the Gifford	Remember	2
3	Explain the limitations of prestressed concrete.	Remember	1
4	Explain the Lee McCall system of prestressing	Understand	1

UNIT-2

SHORT ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	What is meant by end block in a post tensioned member?	Remember	1
2	List any two applications of partial prestressing	Remember	2
3	What is meant by partial prestressing?	Remember	2
4	Define degree of prestressing	Remember	2
5	Define Bursting tension.	Remember	2
6	Define Proof stress	Remember	2
7	Define cracking load	Understand	2
8	Define Debonding.	Remember	1
9	Write formula for Moment of resistance in BIS code.	Remember	1

LONG ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	Explain the different types of losses of prestress in pre-tensioned members	Analyze & Apply	5
2	A simply supported post-tensioned concrete beam of span 10 m has section 200 mm × 450 mm is subjected to an initial prestressing force of 300 kN applied at a constant eccentricity of 75 mm by tendons of 250 mm2 . Find the total loss of prestress in the tendons using the following data: ES = 2×105 N/mm2 , EC = 35 kN/mm2 , anchorage slip = 3 mm, creep coefficient of concrete = 1.5, shrinkage of concrete = 0.0002 and relaxation of steel = 2%	Analyze & Apply	5
3	Explain the various losses of prestress in post-tensioned members	Analyze & Apply	5

UNIT-3

SHORT ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	Sketch the loop reinforcement, hair-pin bars in end blocks.	Remember	1
2	Sketch the correct arrangement of sheet cage in anchorage zone.	Remember	2
3	Define two stage constructions.	Remember	2
4	Write any two general failures of prestressed concrete tanks.	Remember	2
5	Mention the importance of shrinkage in composite construction?	Remember	2

6	Sketch the loop reinforcement, hair-pin bars in end blocks.	Remember	2
7	Sketch the correct arrangement of sheet cage in anchorage zone.	Understand	2
8	Define two stage constructions.	Remember	1
9	Write any two general failures of prestressed concrete tanks.	Remember	1
10	Mention the importance of shrinkage in composite construction?	Remember	2

LONG ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	Determine the total loss of prestress in a simply supported pre-tensioned concrete beam of span 12 m and cross-section 250 mm × 500 mm. The beam is pre-stressed with 900 kN at transfer. The steel cable has a cross-sectional area of 750 mm2 and has a straight profile with an eccentricity of 150 mm. Use M40 grade of concrete and ES = 2×105 N/mm2	Analyze & Apply	5
2	Design an I-section for a simply supported post-tensioned concrete beam of span 12 m subjected to an imposed load of 15 kN/m. Adopt the compressive stresses in concrete at transfer as 18 N/mm2 and 15 N/mm2 at working load. Assume 20 % losses in prestress and tensile stresses are not allowed in concrete.	Analyze & Apply	5
3	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/mm2 and the permissible stresses in concrete are: At transfer : 20 N/mm2 (Compression) and 2.5 N/mm2 (Tensile) At working load : 15 N/mm2 (Compression) and 1.5 N/mm2 (Tensile)	Analyze & Apply	5
4	A prestressing force of 400 kN is to be transmitted through a distribution plate 200 mm × 150 mm, the	Analyze & Apply	5

	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		

UNIT-4

SHORT ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	Specify the various steps involved in design of composite sections	Remember	1
2	Briefly outline the method of computing the ultimate shear strength of composite sections.	Remember	2
3	Briefly outline the method of computing the ultimate flexural strength of composite sections.	Remember	2
4	Briefly outline the method of estimating the deflection of composite members in case of un propped construction b) Propped construction	Remember	2
5	How do you compute the shrinkage and resultant stresses in composite members?	Remember	2
6	Explain with neat sketches, the stresses developed due to differential shrinkage in Structural elements comprising precast pre stressed and cast in-situ concrete elements.	Understand	2
7	Write the construction techniques of composite constructions in pre stressed concrete.	Remember	1
8	Write the analysis of composite construction sections.	Remember	2

LONG ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome

1	Design an end block of a prestressed concrete beam of section 200 mm × 400 mm to transmit the prestressing force of 400 kN by a distribution plate 200 mm× 200 mm concentrically located at the ends. Also determine the maximum bursting force and the maximum tensile stresses.	Analyze & Apply	5
2	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/m2 , determine the resultant stresses developed in the precast and cast-in-situ concrete assuming the pretensioned 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.	Analyze & Apply	5

UNIT-5

SHORT ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	what is main advantage of prestressed concrete bridge deck.	Remember	1
2	Typical types Of Pre-Tensioned Prestressed Concrete Bridges .	Remember	2
3	what is main advantage of prestressed concrete bridge deck	Remember	2
4	Typical types Of Post-Tensioned Prestressed Concrete Bridges .	Remember	2
5	what is main advantage of prestressed concrete bridge deck.	Remember	2
6	Typical types Of Pre-Tensioned Prestressed Concrete Bridges .	Remember	2
7	what is main advantage of prestressed concrete bridge deck	Understand	2
8	Typical types Of Post-Tensioned Prestressed Concrete Bridges .	Remember	1

9	what is main advantage of prestressed concrete bridge deck.	Remember	1
10	How well foundations are classified?	Remember	1

LONG ANSWER QUESTIONS-

S. No.	Questions	Blooms Taxonomy Level	Course Outcome
1	Determine the maximum short-term and the long term deflections of a pre-tensioned concrete beam of section 250 mm×500 mm has an effective span of 15 m. The beam is prestressed by a parabolic cable carrying initial force of 600 kN at transfer. The cable is concentric at the supports and has an eccentricity of 150 mm at its mid-span. The beam is subjected to uniformly distributed live load of 15 kN/m in addition to two concentrated loads of 50 kN each at quarter span points respectively. Adopt M40 grade of concrete, loss of prestress as 20%, creep coefficient is 2 and the permanent load of the transverse load is 25%.	Analyze & Apply	5

XI. OBJECTIVEQUESTIONS:

1. In 1886, Jackson of San Francisco applied for patent in which prestress was introduced by _____
a) Tensioning the reinforced rods in sleeves
b) Tensioning the reinforced rings in sleeves
c) Tensioning the reinforced steel in sleeves
d) Tensioning the reinforced bars in sleeves

2. In 1888, manufacturing of slabs and small beams using embedded tensioned wires in concrete was introduced by _____
a) Dohring
b) Karl marx
c) Emperger
d) Dischinger

3. In the zone of anchorages the material preferred to minimize costs is _____
a) High strength steel
b) High strength bars
c) High strength tendons
d) High strength concrete

4. The length of the prestressing tendon between the end of the member and the point where the steel attains its stress is called _____

a) Anchorage
b) De bonding
c) Cracking load
d) Transmission length

5. In cab cable, the curved portion of the tendon and anchors lie in _____
a) Compression and Tension zone
b) Cracking zone
c) Tension and Compression zone
d) Loading zone

6. The application of prestressed concrete is done for depth ratio's having _____
a) Small span
b) Larger span
c) Same span
d) Equal span

UNIT 2

1. The analysis of stresses developed in prestressed concrete structural elements is based on how many assumptions?
a) 5
b) 4
c) 3
d) 2

2.The tensile stresses when do not exceed the limit of modulus then change in loading of member results in _____
a) Change of bending moment
b) Change of stress
c) Change in shear
d) Change in rupture

3.Which conditions are negligible at the stage of visible cracking on concrete?
a) Bending conditions
b) Joint conditions
c) Zone conditions
d) Loading conditions

4.The stresses due to prestressing are referred as _____
a) Combined stresses
b) Bending stresses
c) Anchoring stresses
d) Tensioning stresses

5. In case of eccentric prestressing force the support force Fsup is _____
a) Fsup = p/a(1+eyb/i2)
b) Fsup = p/a(1+eyb/i2)
c) Fsup = p/a

d) Fsup = p/a-eb

UNIT 3

1.The failure due to fracture of steel in tension in the beam is because of _____
a) Excess amount of steel reinforcement
b) Excess amount of prestressed concrete
c) Least amount of reinforcement
d) Least amount of prestressed concrete

2.If the concrete in tension zone get cracks will lead to development of _____
a) Principal stresses
b) Compression
c) Tensile stresses
d) Strain

3.The failure due to fracture steel in tension can be prevented by providing a steel reinforcement is?
a) 0.15 – 0.2%
b) 0.20% – 0.35%
c) 0.2% – 0.6%
d) 0.6% – 0.10%

4.In under reinforced section failure the beam observes _____
a) Excess elongation
b) Less elongation
c) Edge elongation
d) Mid span elongation

5.Due to excess elongation of steel, the neutral axis near the compression face gets _____
a) Increased
b) Decreased
c) Elongates
d) Crushes

6.Which type of deflections is observed in compression face during under reinforced section failure?
a) Small deflections
b) Large deflections
c) Bondage deflections
d) Shrinkage deflections

UNIT 4

1.Design a pretensioned roof pull-in to suit the data Fcu, concrete cube strength = 50n/mm2, effective span = 6m, applied load = 5kn/m, dead load = 1.4, live load = 1.6, $\beta = 0.125$, k = 7.5, Dc = 2400, and determine ultimate moment and shear? (A)
a) 42 and 27.75
b) 54 and 27.75
c) 34 and 27.75
d) 20 and 28

2.Design cross sectional dimensions of pretensioned roof pull given that b is 0.5d? (C)
a) 250
b) 260
c) 270
d) 280

3.Find the approximate thickness of web if b is 0.5d, d is 270mm, d/h ratio is 0.85, h is 315mm, adopt effective depth, d = 275mm overall depth , h is 320mm, width of flange of 160mm and Average thickness of flange is 70mm since sloping flanges are used, increases the flange thickness by 20 percent? (B)
a) 45mm
b) 43mm
c) 41mm
d) 42mm

4.Find minimum range of stresses if fct is 15n/mm2, fcw is 17, ftw is zero, fu is -1n/mm2, η is 0.8? (A)
a) 12 and 18n/mm2
b) 13 and 14n/mm2
c) 12 and 15n/mm2
d) 10 and 16n/mm2

5.Find minimum section modulus given data is mg is 3.86×106, mq is 22.50×106, fbr is given as 12 and the loss ratio is 0.8? (B)
a) 134×104
b) 182×104
c) 123×104
d) 120×104

6.Find the supporting force if given characteristic strength is -1, moment of gravity is 3.86×106, zt = 230×104? (A)
a) -2.68n/mm2
b) -3.45n/mm2
c) -1.23n/mm2
d) 13.56n/mm2

7.Check for ultimate flexural strength if given Aps is 154mm2, fpu is 1600n/mm2, b is 160mm, fcu is 50n/mm2and diameter is 265mm? (B)
a) 9.65
b) 0.116
c) 3.442
d) 2.345

8.Find ultimate shear strength (check it for safe against shear failure) if vu is 27.75kn, Loss ratio is 0.8, prestressing force is 182000, area is 31400, breadth is 50 where height is 320, prestressing force is 1.7, fcp = 4.65, ft is 1.7? (A)
a) Safe
b) Unsafe
c) Zero
d) Collapse

9.Find the deflection due to self weight given that $\phi = 1.6$, Ee = 2.6Ece, elastic modulus of concrete is 34×103, gravity is given as 6, self weight is 0.76, Length of the cable is 1000, elastic modulus of concrete is 34×103 , Moment of inertia is 3200×105? (D)
a) 1.66mm
b) 5.3mm
c) 23.4mm
d) 1.02mm

Check for deflection due to prestressing force if given data is Prestressing force is 182×103 eccentricity of cable is 105, Length of the cable is 1000, elastic modulus of concrete is 34×103, Moment of inertia is 3200×105? (C)
a) 9.4
b) 4.5
c) 6.8
d) 9.8

UNIT 5

1.The composite sections provide one monolithic action between _____ (A)
a) Prefabricated units
b) Post fabricated units
c) Pasteurized units
d) Tensioned units

2.The high strength prestressed units are used in which zone? (B)
a) Compression zone
b) Tension zone
c) Span zone
d) Beam zone

3.The Composite construction was first tries for a motorway bridge? (A)
a) 1940
b) 1945
c) 1960
d) 1980

4.Due to the effect of composite action sizes of precast prestressed units can be _____ (B)
a) Increased
b) Reduced
c) Deducted
d) Serviced

5.In many cases precast prestressed unit serve as _____ (A)
a) Supports and dispences
b) Girders and dispences
c) Area and dispences
d) Beams and dispences

6.The efficient utilization of material in a composite section in which the low and medium strength concrete resists? (C)
a) Tensile forces
b) Principal forces
c) Compressive forces
d) Axial forces

7.The combination of light weight concrete for the cast insitu slab results in reduced _____ (B)
a) Live loads
b) Dead loads
c) Constant loads
d) Limited loads

8.In case of conventional method there will be a steel beam and slab construction in which the components carries their? (A)
a) Entire load
b) Half load
c) Span load
d) Deflection

9.The main components of the composite beam are prestressed precast stem and _____ (A)
a) A cast insitu flange
b) A cast insitu beam
c) A cast insitu slab
d) A cast insitu column

10.To attain the composite action the precast stem and the flange is _____ (C)
a) Laced together
b) Tied together
c) Keyed together
d) Cutted together