PRESTRESSED CONCRETE

(Professional Elective- III)

Course Code: 20CE1163

LTPC

Pre-requisites: Strength of materials, Building Materials and Concrete Technology, ReinforcedConcrete Structures

Course Outcomes:

At the end of the course, the student will be able to:

CO1: Describe the prestressing materials and prestressing systems

CO2: Calculate the loss of pre-stress and analyse stresses in the prestressed section

CO3: Design the section for flexure and shear

CO4: Design of end blocks for pre and post tensioned sections

CO5: Calculate the net deflections in prestressed beams

UNIT-I

INTRODUCTION:

Historic development - General principles of pre-stressing -pretensioning and post tensioning - Advantages and limitations of prestressed concrete - Materials - High strength concrete and hightensile steel and their characteristics.

PRESTRESSING METHODS:

I.S.Code provisions, Methods and Systems of Pre-stressing; Pre-tensioning and posttensioning methods - Analysis of post tensioning - Different systems of pre-stressing like Hoyer system, MagnelBlaten system, Freyssinet system and Gifford Udall System.

Learning outcomes:

- 1. Explain the principles of prestressing (L2)
- 2. Describe the materials used and their characteristics (L2)
- 3. Explain the methods and systems of prestressing (L2)

UNIT-II

LOSSES OF PRESTRESS:

Loss of pre-stress in pre tensioned and post tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

ANALYSIS OF SECTIONS FOR FLEXURE:

Analysis of sections for flexure; Elastic analysis of concrete beams pre-stressed with straight, Concentric, eccentric, bent and parabolic tendons, kern lines.

Learning outcomes:

- 1. Compute the losses of prestress in pretensioned members (L4)
- 2. Compute the losses of prestress in post tensioned members (L3)
- 3. Analyse the prestressed concrete beams for flexure with different tendons (L4)

(10 Lectures)

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UNIT-III

DESIGN OF SECTIONS FOR FLEXURE AND SHEAR:

Allowable stress, Design criteria as per I.S. Code – Elastic design of simple rectangular and Isection for flexure, shear, and principal stresses – design for shear in beams.

Learning outcomes:

- 1. Calculate the allowable stresses (L3)
- 2. Design a section for flexure (L3)
- 3. Design a section for shear (L3)

UNIT-IV

ANALYSIS OF END BLOCKS:

Analysis of end Blocks by Guyon's method and Mugnel method, Anchorage zone stress – Approximate method of design – Anchorage zone reinforcement – Transfer of pre- stress in pretensioned members.

Learning outcomes:

- 1. Analyse the end blocks by Guyon's and Mugnel methods(L4)
- 2. Compute the reinforcement of anchorage zone (L3)
- 3. Design the end block by approximate method (L3)

UNIT-V

DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS:

Importance of control of deflections – factors influencing deflections – short term deflections of uncracked members, prediction of long term deflections, stage wise prestressing. Design principle of Post Tensioned Slabs.

Learning outcomes:

- 1. Summarize the factors influencing deflections (L2)
- 2. Compute the short term and long term deflections(L3)
- 3. Explain about stage wise prestressing(L2)

TEXT BOOKS:

- 1. Krishna Raju N, "Prestressed Concrete", Tata Mc.Graw Hill Publications, 4th Edition, 2007.
- 2. Rajagopalan. N, "Prestressed Concrete", Narosa publications, 2nd Edition, 2006.

REFERENCES:

- 1. Ramamrutham S., "Prestressed Concrete", Dhanpatrai Publications, 4th Edition, 2006.
- 2. Lin T.Y. & Ned H. Burns, "Design of Prestressed Concrete Structures", John Wiley & Sons, 3rd Edition, 2004.
- 3. All the relevant codes.

(10 Lectures)

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