DEMAND

PAVIATH INTEGRATED SOLUTION

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THEORY OF STRUCTURES

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OBJECTIVES: :

• ANALYSIS OF PROPPED CANTILEVERS AND FIXED BEAMS BY AREA-MOMENT METHOD AND DRAW SFD, BMD. • ANALYSIS CONTINUOUS BEAMS BY THEOREM OF THREE MOMENTS AND DRAW SFD, BMD. • ANALYSIS CONTINUOUS BEAMS, PORTAL FRAMES AND SUBSTITUTE FRAMES BY MOMENT DISTRIBUTION METHOD AND DRAW SFD, BMD. • DEFINE DIFFERENT TYPES OF COLUMNS AND FIND CRITICAL LOADS OF COLUMNS. • ANALYSIS COLUMNS AND CHIMNEYS SUBJECT TO ECCENTRIC LOADING / MOMENT / HORIZONTAL LOADS AND FIND MAXIMUM AND MINIMUM COMBINED STRESSES IN THEIR SECTIONS. • CALCULATION OF MAXIMUM AND MINIMUM BEARING PRESSURES AND CHECK THE STABILITY OF MASONRY DAMS AND RETAINING WALL.

1.1 SLOPE AND DEFLECTION OF BEAMS

DEFLECTED SHAPES / ELASTIC CURVES OF BEAMS WITH DIFFERENT SUPPORT CONDITIONS –DEFINITION OF SLOPE AND DEFLECTION- FLEXURAL RIGIDITY AND STIFFNESS OF BEAMS- MOHR'S THEOREMS – AREA MOMENT METHOD FOR SLOPE AND DEFLECTION OF BEAMS – DERIVATION OF EXPRESSIONS FOR MAXIMUM SLOPE AND MAXIMUM DEFLECTION OF STANDARD CASES BY AREA MOMENT METHOD FOR CANTILEVER AND SIMPLY SUPPORTED BEAMS SUBJECTED TO SYMMETRICAL UDL & POINT LOADS – NUMERICAL PROBLEMS ON DETERMINATION OF SLOPES AND DEFLECTIONS AT SALIENT POINTS OF CANTILEVERS AND SIMPLY SUPPORTED BEAMS FROM FIRST PRINCIPLES AND BY USING FORMULAE

1.2 SHEAR FORCE AND BENDING MOMENT DIAGRAM FOR PROPPED CANTILEVERS

STATICALLY DETERMINATE AND INDETERMINATE STRUCTURES- STABLE AND UNSTABLE STRUCTURES- EXAMPLES- DEGREE OF INDETERMINACY- CONCEPT OF ANALYSIS OF INDETERMINATE BEAMS - DEFINITION OF PROP –TYPES OF PROPS- PROP REACTION FROM DEFLECTION CONSIDERATION – DRAWING SF AND BM DIAGRAMS BY AREA MOMENT METHOD FOR UDL THROUGHOUT THE SPAN, CENTRAL AND NON-CENTRAL CONCENTRATED LOADS – PROPPED CANTILEVER WITH OVERHANG – POINT OF CONTRA FLEXURE.

2.1 FIXED BEAMS – AREA MOMENT METHOD

INTRODUCTION TO FIXED BEAM - ADVANTAGES –DEGREE OF INDETERMINACY OF FIXED BEAM- SAGGING AND HOGGING BENDING MOMENTS – DETERMINATION OF FIXING END(SUPPORT) MOMENTS(FEM) BY AREA MOMENT METHOD – DERIVATION OF EXPRESSIONS FOR STANDARD CASES – FIXED BEAMS SUBJECTED TO SYMMETRICAL AND UNSYMMETRICAL CONCENTRATED LOADS AND UDL – DRAWING SF AND BM DIAGRAMS FOR FIXED BEAMS WITH SUPPORTS AT THE SAME LEVEL (SINKING OF SUPPORTS OR

2.2 BEAMS – THEOREM OF THREE MOMENTS METHOD

INTRODUCTION TO CONTINUOUS BEAMS – DEGREE OF INDETERMINACY OF CONTINUOUS BEAMS WITH RESPECT TO NUMBER OF SPANS AND TYPES OF SUPPORTS –SIMPLE/PARTIALLY FIXED / FIXED SUPPORTS OF BEAMS- GENERAL METHODS OF ANALYSIS OF INDETERMINATE STRUCTURES – CLAPEYRON'S THEOREM OF THREE MOMENTS – APPLICATION OF CLAPEYRON'S THEOREM OF THREE MOMENTS FOR THE FOLLOWING CASES – TWO SPAN BEAMS WITH BOTH ENDS SIMPLY SUPPORTED OR FIXED – TWO SPAN BEAMS WITH ONE END FIXED AND THE OTHER END SIMPLY SUPPORTED – TWO SPAN BEAMS WITH ONE END SIMPLY SUPPORTED OR FIXED AND OTHER END OVERHANGING –DETERMINATION OF REACTIONS AT SUPPORTS

3.1 CONTINUOUS BEAMS – MOMENT DISTRIBUTION METHOD

INTRODUCTION TO CARRY OVER FACTOR, STIFFNESS FACTOR AND DISTRIBUTION FACTOR –STIFFNESS RATIO OR RELATIVE STIFFNESS- CONCEPT OF DISTRIBUTION OF UN BALANCED MOMENTS AT JOINTS - SIGN CONVENTIONS - APPLICATION OF M-D METHOD TO CONTINUOUS BEAMS OF TWO / THREE SPANS AND TO PROPPED CANTILEVER (MAXIMUM OF THREE CYCLES OF DISTRIBUTION SUFFICIENT) – FINDING SUPPORT REACTIONS- PROBLEMS - SKETCHING SFD AND BMD FOR TWO / THREE SPAN BEAMS.

3.2 PORTAL FRAMES – MOMENT DISTRIBUTION METHOD

DEFINITION OF FRAMES – TYPES – BAYS AND STOREY - SKETCHES OF SINGLE/MULTI STOREY FRAMES, SINGLE/MULTI BAY FRAMES- PORTAL FRAME – SWAY AND NON- SWAY FRAMES- ANALYSIS OF NON SWAY (SYMMETRICAL) PORTAL FRAMES FOR JOINT MOMENTS BY MOMENT DISTRIBUTION METHOD AND DRAWING BMD ONLY– DEFLECTED SHAPES OF PORTAL FRAMES UNDER DIFFERENT LOADING / SUPPORT CONDITIONS.

4.1 COLUMNS AND STRUTS

COLUMNS AND STRUTS – DEFINITION – SHORT AND LONG COLUMNS – END CONDITIONS – EQUIVALENT LENGTH / EFFECTIVE LENGTH– SLENDERNESS RATIO – AXIALLY LOADED SHORT COLUMN - AXIALLY LOADED LONG COLUMN – EULER'S THEORY OF LONG COLUMNS – DERIVATION OF EXPRESSION FOR CRITICAL LOAD OF COLUMNS WITH HINGED ENDS – EXPRESSIONS FOR OTHER STANDARD CASES OF END CONDITIONS (SEPARATE DERIVATIONS NOT REQUIRED) – PROBLEMS – DERIVATION OF RANKINE'S FORMULA FOR CRIPPLING LOAD OF COLUMNS– FACTOR OF SAFETY- SAFE LOAD ON COLUMNS- SIMPLE PROBLEMS.

5.1 MASONRY DAMS

GRAVITY DAMS – DERIVATION OF EXPRESSION FOR MAXIMUM AND MINIMUM STRESSES AT BASE – STRESS DISTRIBUTION DIAGRAMS - PROBLEMS – FACTORS AFFECTING STABILITY OF MASONRY DAMS – FACTOR OF SAFETY- PROBLEMS ON STABILITY OF DAMS– MINIMUM BASE WIDTH AND MAXIMUM HEIGHT OF DAM FOR NO TENSION AT BASE – ELEMENTARY PROFILE OF A DAM – MINIMUM BASE WIDTH OF ELEMENTARY PROFILE FOR NO TENSION.

TEXT BOOKS:

1. B.C. PUNMIA, ASHOK JAIN & ARUN JAIN," THEORY OF STRUCTURES ",LAXMI PUBLICATIONS, 9TH EDITION, APRIL1992.
2. S.B. JUNNARKAR, MECHANICS OF STRUCTURES (VOL.II) CHARATOR PUBLICHING, 22ND EDITION,1997.

REFERENCE:

1. V.N. VAZIRANI & M.M. RATWANI, "ANALYSIS OF STRUCTURES"
2. R.L. JINDAL , "ELEMENTARY THEORY OF STRUCTURES"
3. FV. WARNOCK, "STRENGTH OF MATERIALS"
4. MADHAN MOHAN DASS, " STRUCTURAL ANALYSIS" PHI LEARNING PVT. LTD., NEW DELHI

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info@paviathintegratedsolution.com -www.paviathintegratedsolution.com www.paviathjobportal.com