

INTRODUCTION TO NUMERICAL METHODS

Note Title

1/10/2011

MOST ENGINEERING ANALYSIS INVOLVE :

1.- DEVELOPMENT OF A MATHEMATICAL MODEL TO REPRESENT THE PHYSICAL SYSTEM

2.- DERIVATION OF GOVERNING EQUATIONS BY APPLYING PHYSICAL LAWS

EQUILIBRIUM

LAWS OF MOTION

CONSERVATION OF MASS

CONSERVATION OF ENERGY

NM
→

3.- SOLUTION OF THE GOVERNING EQUATIONS

SET OF LINEAR EQUATIONS

SET OF NON-LINEAR EQUATIONS

SET OF ORDINARY DIFF. EQUATIONS

SET OF PARTIAL DIFF. EQUATIONS

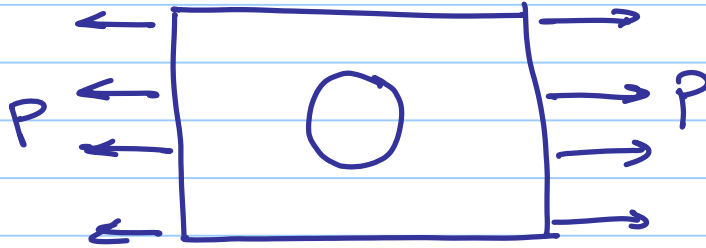
SET OF HOMOGENEOUS EQUATIONS

VERY DIFFICULT TO FIND ANALYTICAL SOLUTIONS IN MOST OF THE CASES.

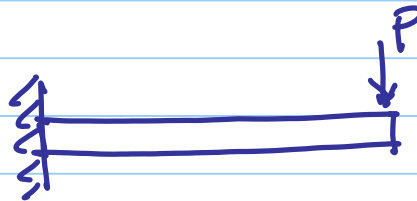
Ex.



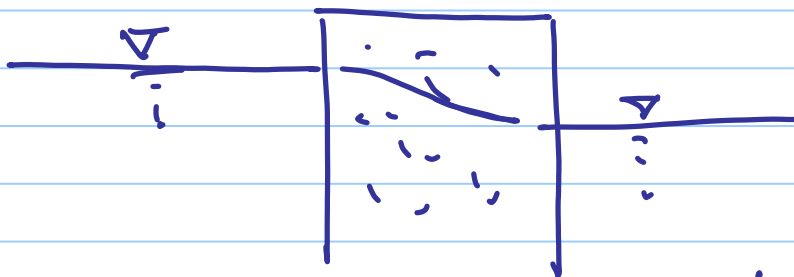
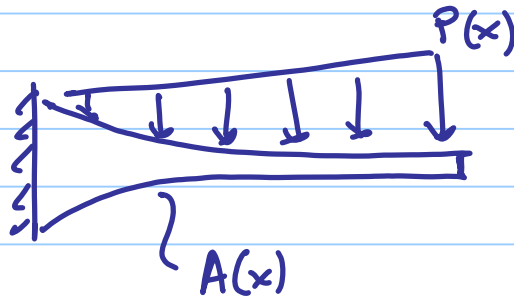
STRESS
ANALYSIS



'PLATES'

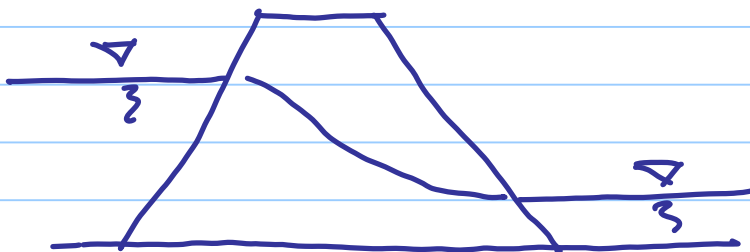


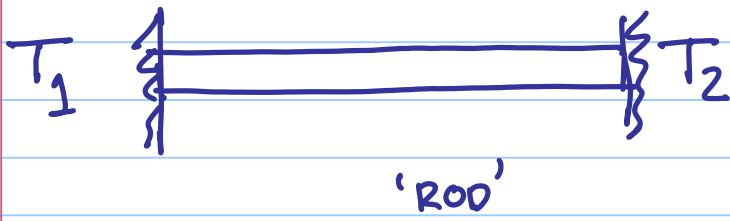
'BEAMS'



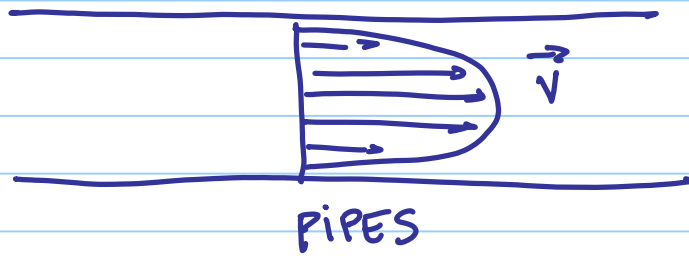
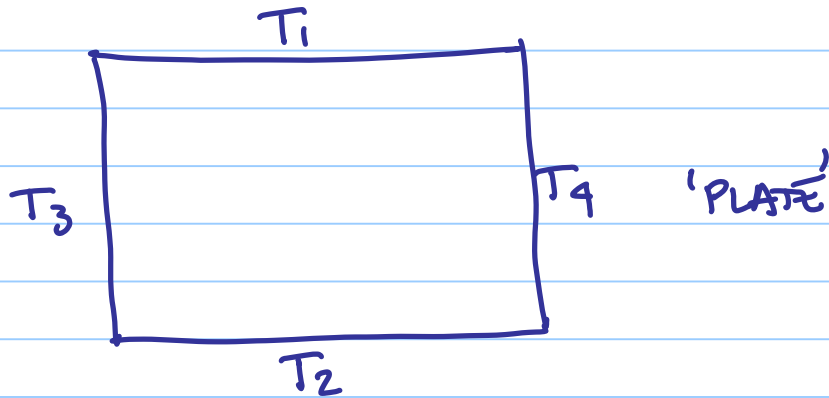
GROUND
WATER
FLOW

'DAMS'





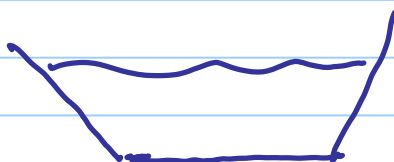
HEAT
TRANSFER



FLUID
MECHANICS



DAM
BREAK
PROBLEM



OPEN
CHANNELS

NUMERICAL SOLUTIONS ARE THOSE THAT CANNOT BE EXPRESSED IN THE FORM OF MATHEMATICAL EXPRESSIONS. NUMERICAL SOLUTIONS GIVE THE VALUE OF THE UNKNOWN FUNCTION AT DIFFERENT POINTS OF THE DOMAIN (APPROXIMATED SOLUTION)

THEY USUALLY IMPLY INTENSIVE CALCULATIONS AND/OR ITERATIVE PROCEDURES \Rightarrow PROGRAMMING IS REQUIRED!

HIGH LEVEL LANGUAGES :

FORTRAN

C++

VISUAL BASIC

SOFTWARE PACKAGES :

MATLAB

MATHECAD



RECOMMENDED.