بسم الله الرحمن الرحيم
السلام عليكم ورحمة الله وبركاته

الى الاخوة والاخوات اعضاء منتدى الهندسة نت

Dynamic of Structures

“Introduction”

المهندس الانشائي

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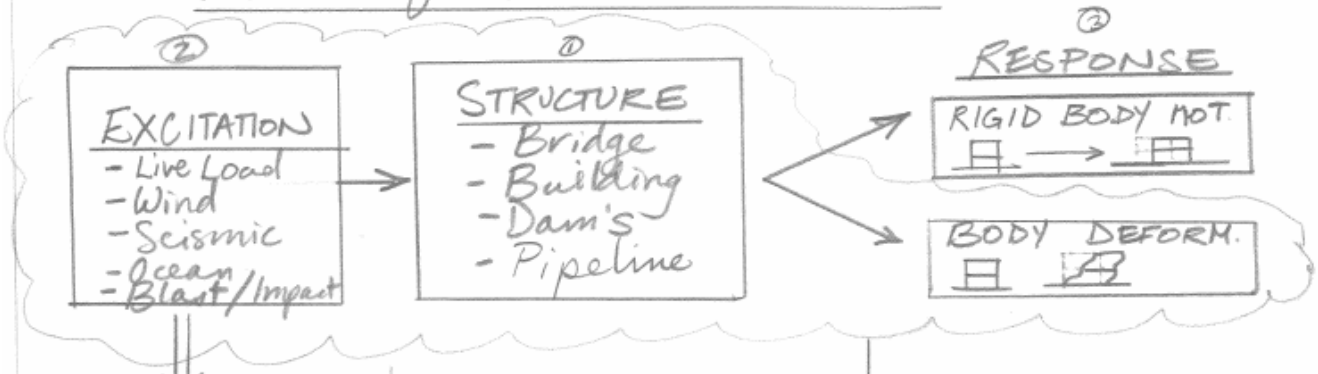
سوريا/ حمص

CLASS #1

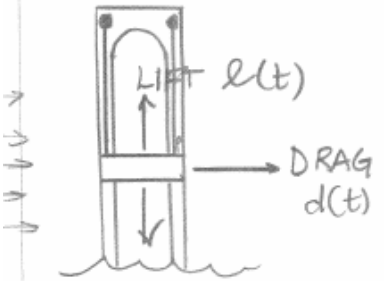
① Handouts - Course Description
Homework #1 (Math for Dynamics)
Los Alamos Summer School
Read Ch 1 & 2

② Lecture:

"OVERVIEW of STRUCTURAL DYNAMICS"



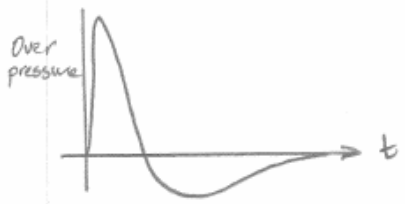
WIND LOADS (Slow Video)



- 2 FORCES
  - Lift
  - Drag
- Depend upon wind velocity
  $d(t) \propto f(v)$
  $\ell(t) = f(v)$
- Design Codes Equate to Static load
  → not well suited for long, slender structures
  - Tacoma Narrows Bridge
- Only known

BLAST / IMPACT

- September 11, 2001
  - New concern for civilian structures
- Blast occur from TNT explosive & is an instaneous release of energy
  - ↳ Shockwave



- Given blast size (equivalent TNT) & location,
  - Deterministic load

* SEISMIC *

Release of energy from earth crust - tectonic forces
- Most severe load placed on civil structures!

- Earthquake motion is very complex
  - Near field
  - Far field

- High Amplitude
- Dominated by Pulse Loads

- Attenuated
- Signal Filtered
- Not as Pulse like

- Engineering community measures ground accelerations
  - ↳ load for civil structures

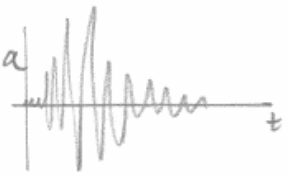
- Stochastic Load

LIVE LOAD (Show Video)

- Vehicle traffic
- People - walking
  - ex: Millenium Bridge, London
- Rotating Machinery
  - ↓ major concern in high-technology manufacturing

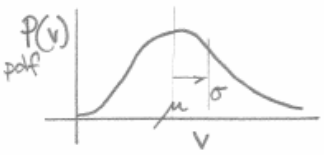
LOADING CLASSIFICATIONS:

① Deterministic
- Rotating Machinary
- Last Earthquake (seismograph)



(VS)

② "Random" Dynamic Load
- Wind load
- Next Earthquake



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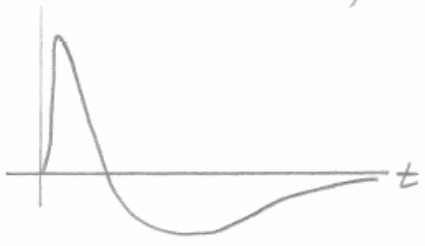
① Periodic (Rotating Machinery)

Repeats in time
Time to Repeat, T = Period
$\frac{1}{T}$ = FREQUENCY = f

(VS)

② Non-Periodic (Blast)



Structures MODELS

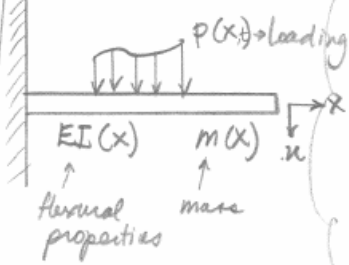
Model is a mathematical representation of a structure

Distributed Parameter (Continuous)

- Realistic
- Difficult to Analyze

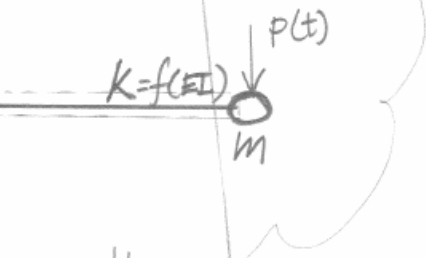
Discrete Parameter

- Idealization
- Easy to analyze
- Approximate



$$\frac{\partial^2}{\partial x^2}\left(EI\frac{\partial^2 u}{\partial x^2}\right) + m(x)\frac{\partial^2 u}{\partial t^2} = p(x,t)$$

PDE



$$m\ddot{u} + k\,u = p(t)$$

ODE

FOR COURSE → ASSUME **LINEAR TIME INVARIANT (LTI) SYSTEM**

Linear → Independent of Response

TI → Constant System parameters m, k, c