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Why do we want to do pole placement

- They describe the behaviour of the sytem
- For eg
  - in second order system rise time , peak time etc.
  - can be explained by zeta and omega_n
  - which are nothing but indicate the position of the poles

Dominant and Non Dominant Roots

- To modify system only 2 root are dominant
- Other n-2 will be non dominant roots

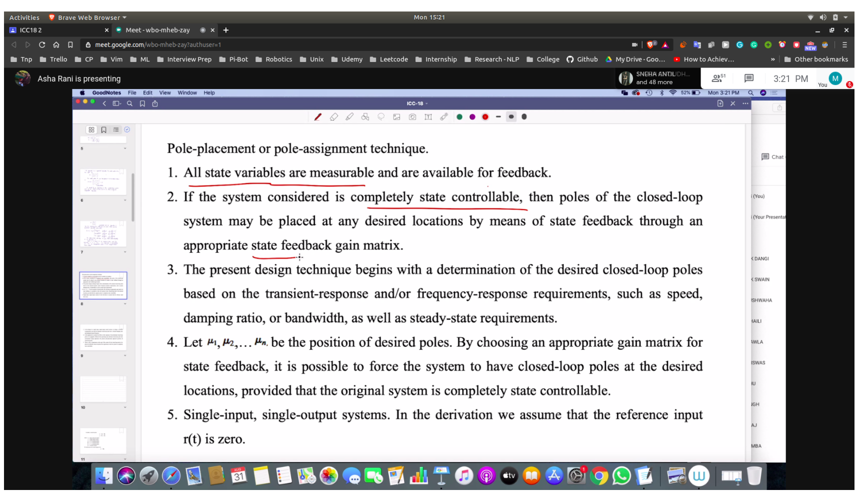
Solution of |SI - A|

- The solution of the characterisitic equation are the eigen values

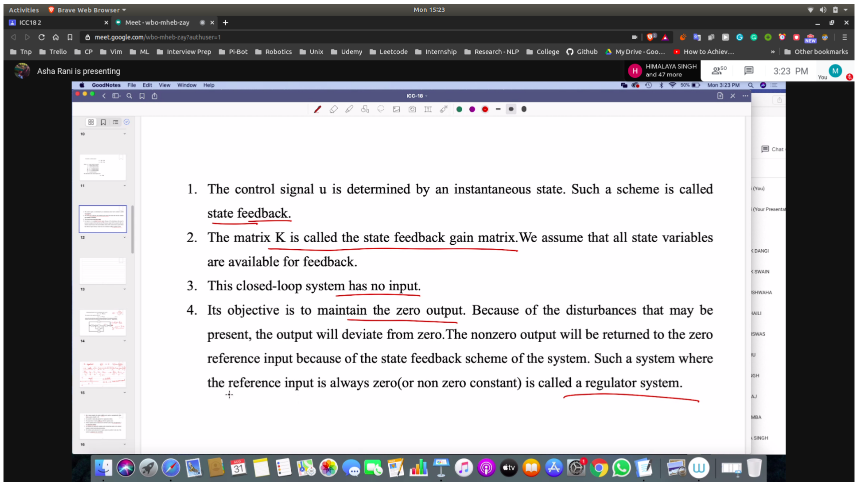
Value of U

- U is written as -k * x(input) to control the pole of the system

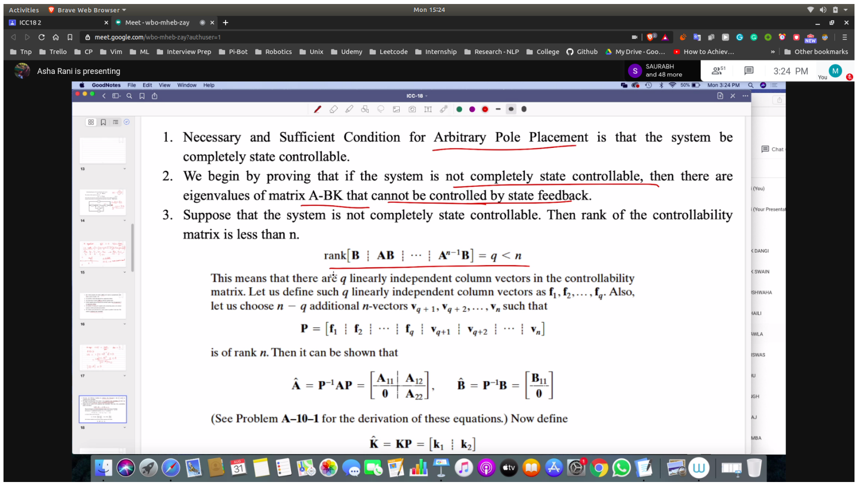
Assumptions for pole placement

- 

Terms

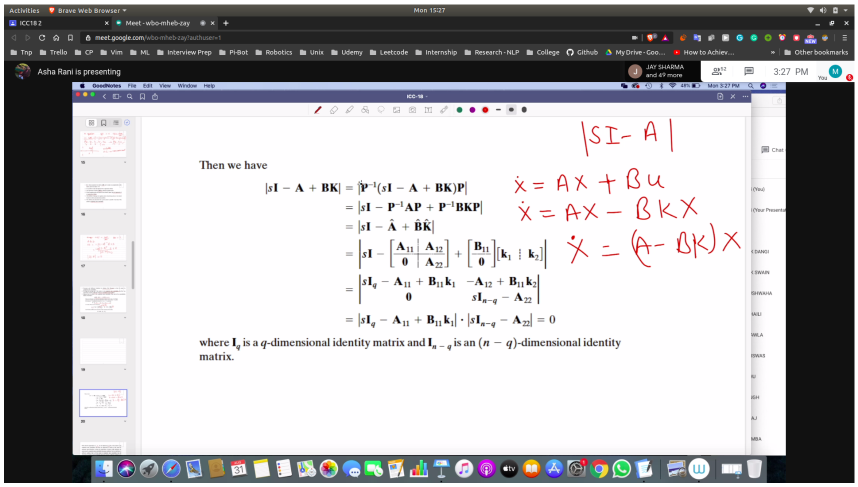
- 

Condition for arbitary pole placement

- 

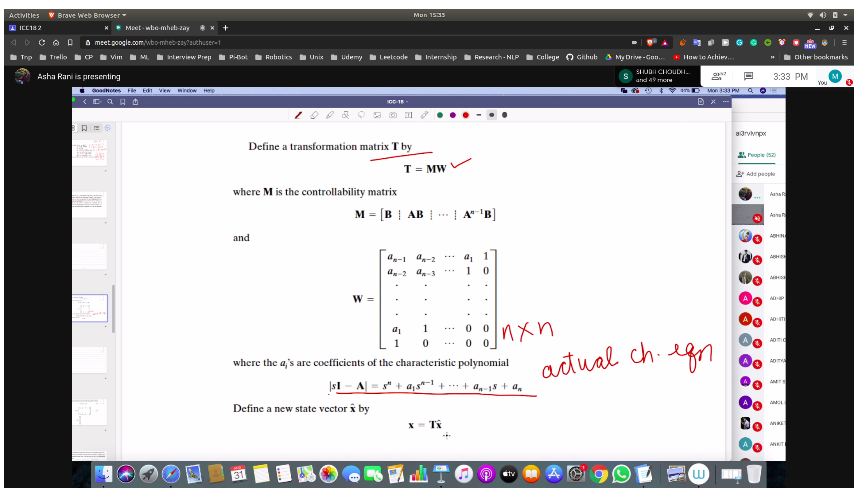
Here somewhere there is a proof that matrix should be controllable for pole placement

Characteristic Eqn for system with state feedback

- 

- In this q poles will be controllable
- Then n-q poles will not be controllable
- So proved that we need to have full controllable matrix

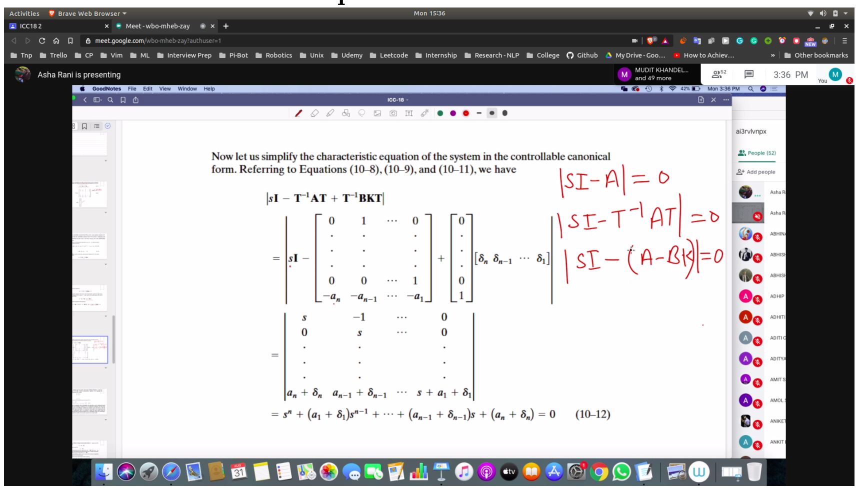
How to do pole placement?

- 

- Transform the system using T
- the sytem will be in a controllable form

Char eqn in controllable form

- This is the actual char eqn



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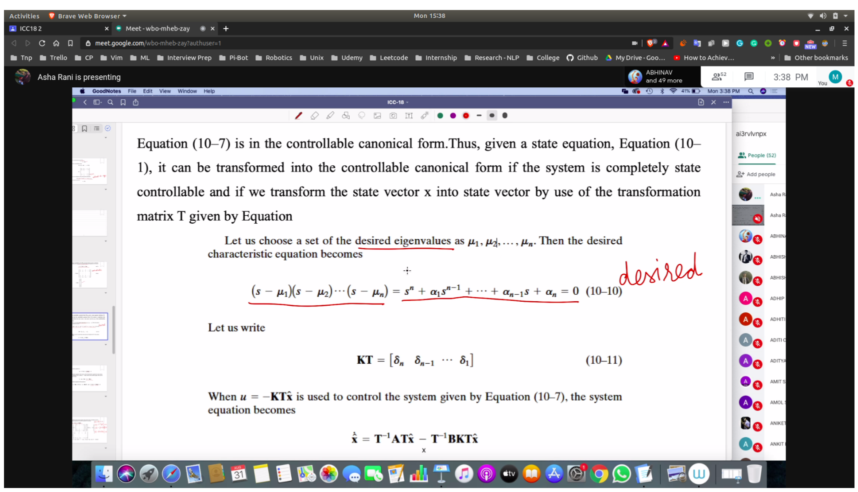
- a1 + delta1 = alpha1
- a2 + delta2 = alpha2

Desired Char Eqn



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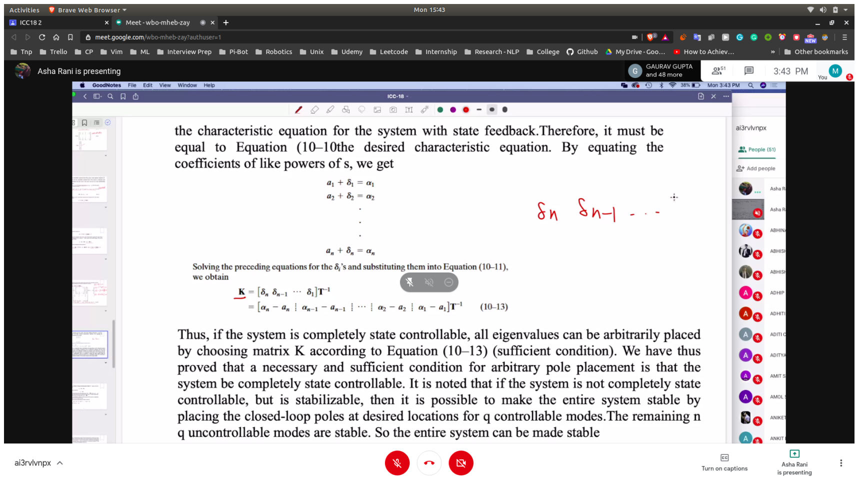
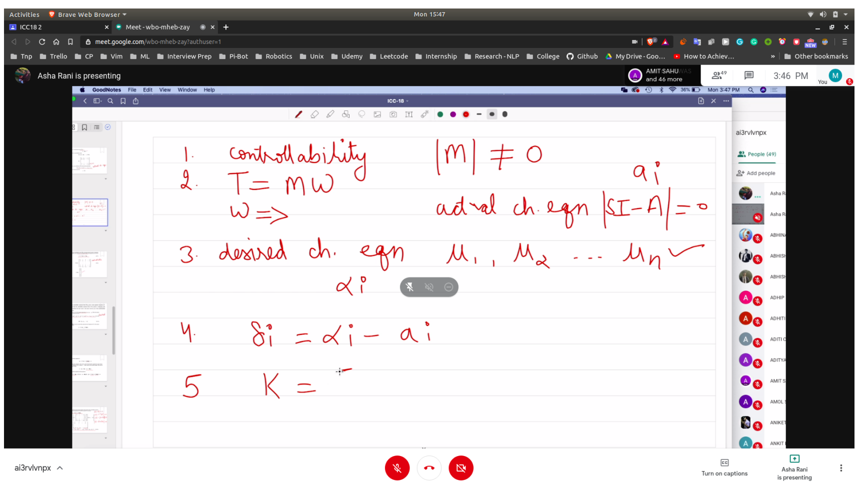
To make Desired == Equal

- Find K using delta i K = [. . . . . .]



Summary



- Find M |M|!=0
- Find T = MW
- Desired char eqn
- Calculte delta i from above
- Calculate K using delta values