

design
$$\int \rightarrow \Sigma$$

↓
میترو

→ ^{نماذج} Physical sys Simulation ^{نقطة} (sys)

① of distributed components

(2) modular model N , model 15 plus

② mechanical model, mech, elec

③ special

زی المعایب کده خواہ Functions کثیرہ اوی بیس سے الآخر قدامت Box متعلق

MC II Jpg ← (3) (1) (2)
(4) Hardware / software / processor in The loop

تأكد من تشغيل الميكروكنترولر على البرنامج (software)

⑤ Assurance of properties → verification → Correct product
validation being Developed

↳ validation

↓
right product Being Developed

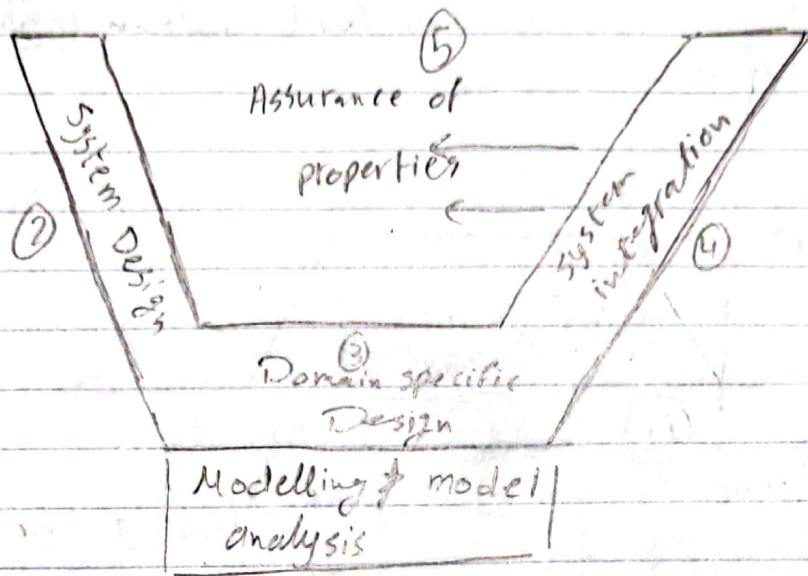
الفكرة إلى ذات مختارها مناسبة لى أنا عايزه ولا لا

V-model

Macro Cycle

Requirements ①

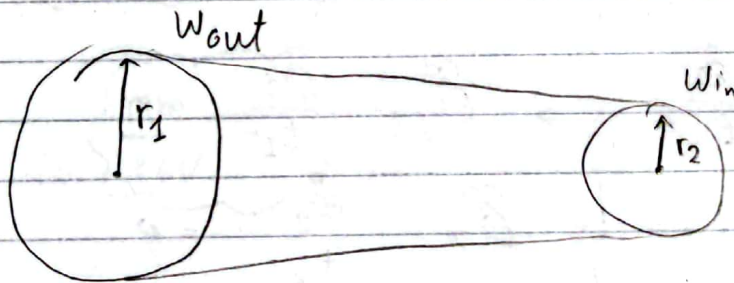
Product



Actuator

sizing

- max Torque T
- route mean square Torque T_{rms}
- max speed $\dot{\theta} (w)$



efficiency

$$\mu \quad T_{in} \omega_{in} = T_{out} \omega_{out}$$

$$\frac{\omega_{in}}{\omega_{out}} = N = \frac{r_1}{r_2}$$

(3) Torque اللى من العكس بس من اللى

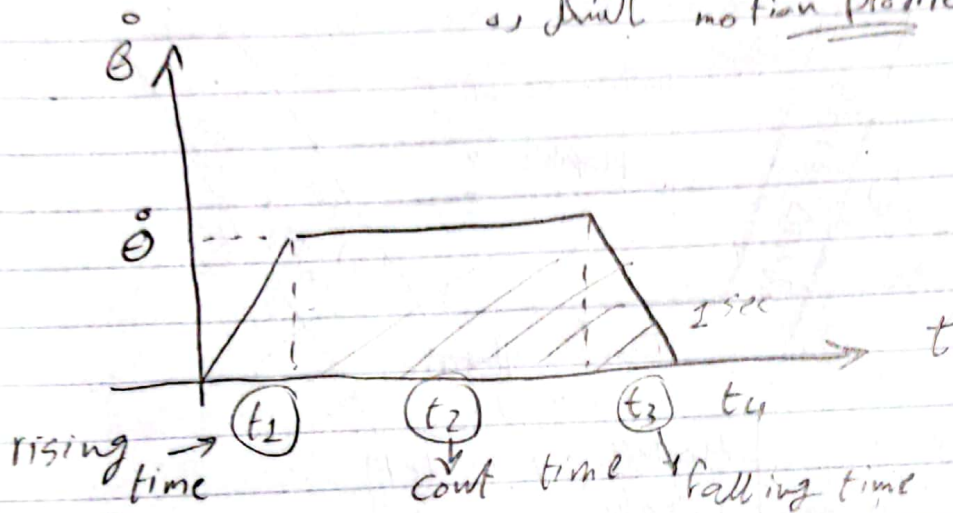
$$\Sigma \tau = I \alpha$$

فجيبه على ال pulleys اللى وبتبقى
وتبقى لنتايج

$$\frac{1}{2} I_{in} \omega_{in}^2 = \frac{1}{2} I_{out} \omega_{out}^2$$

$$I_{in} = I_{out} \times \left(\frac{1}{N^2} \right) \times \frac{1}{f}$$

↓ $\left(\frac{W_{out}}{W_{in}} \right)^2$
 or, kinetic motion profile nearby file



$$\Theta = 2\pi$$

$$\int_0^1 \ddot{\theta} dt = 2\pi \quad \boxed{2\pi} \rightarrow \text{go to } \Theta \rightarrow \text{Jolkin dals}$$

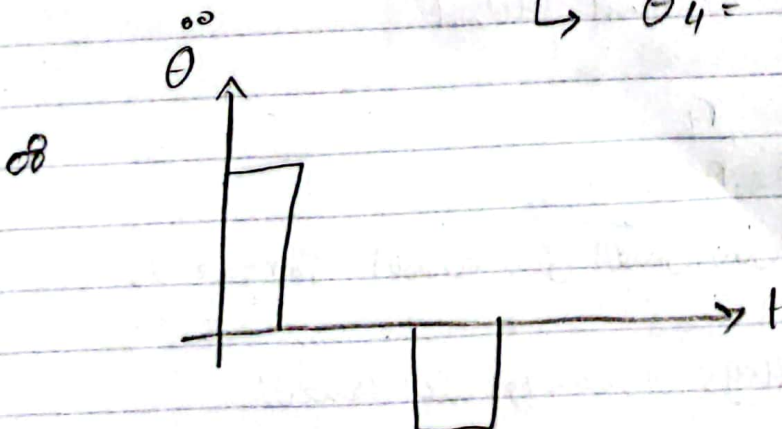
$$\frac{1}{2} \ddot{\theta} t_1 + t_2 \ddot{\theta} + \frac{1}{2} \ddot{\theta} t_3 = 2\pi \quad \ddot{\theta} = \checkmark$$

$$\alpha \cdot \ddot{\theta} = \frac{\ddot{\theta}}{t} \rightarrow \ddot{\theta}_1 = \frac{\ddot{\theta}_1}{t_1}$$

$$\hookrightarrow \ddot{\theta}_2 = \frac{\ddot{\theta}_2}{t_2} = 0$$

$$\hookrightarrow \ddot{\theta}_3 = \frac{\ddot{\theta}_3}{t_3}$$

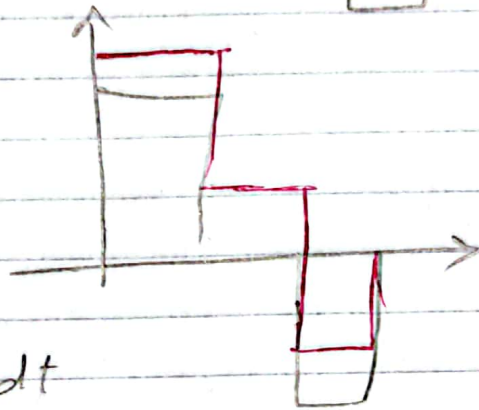
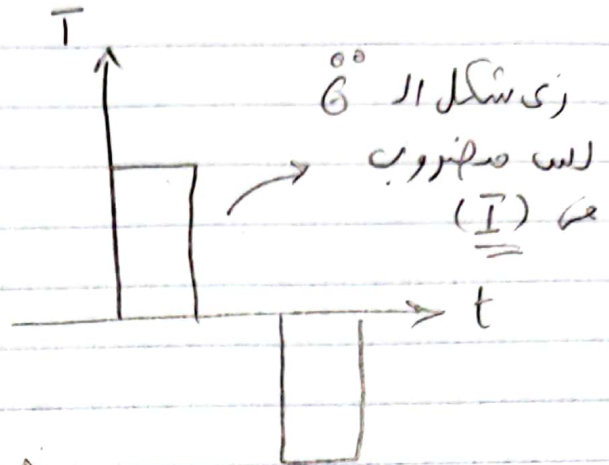
$$\hookrightarrow \ddot{\theta}_4 = \frac{\ddot{\theta}_4}{t_4} = 0$$



$$T = T_m = I \alpha$$

$$\text{if } \underline{T_m = 0}$$

$$\text{if } T_m \neq 0$$



$$T_{rms} = U \frac{1}{T_{period}} \int_0^{T_{period}} T_m^2 dt$$

$$T \omega = \eta F v$$

power screw η

$$\frac{mm}{rev} = \frac{v}{\omega}$$