$$-r_3\dot{\theta}_3\cos\theta_3 + r_4\dot{\theta}_4\cos\theta_4 = r_2\dot{\theta}_2\cos\theta_2 - r_2\dot{\theta}_2^2\sin\theta_2$$

Q) A 4 bar linkage with crank length = 2 unit, coupler length = ~~3 unit~~ 3.5 unit, follower length = 4 unit and fixed link length is 1 unit.

I) When $\theta_1 = 0°$ and $\theta_2 = 90°$, find out θ_3 and θ_4

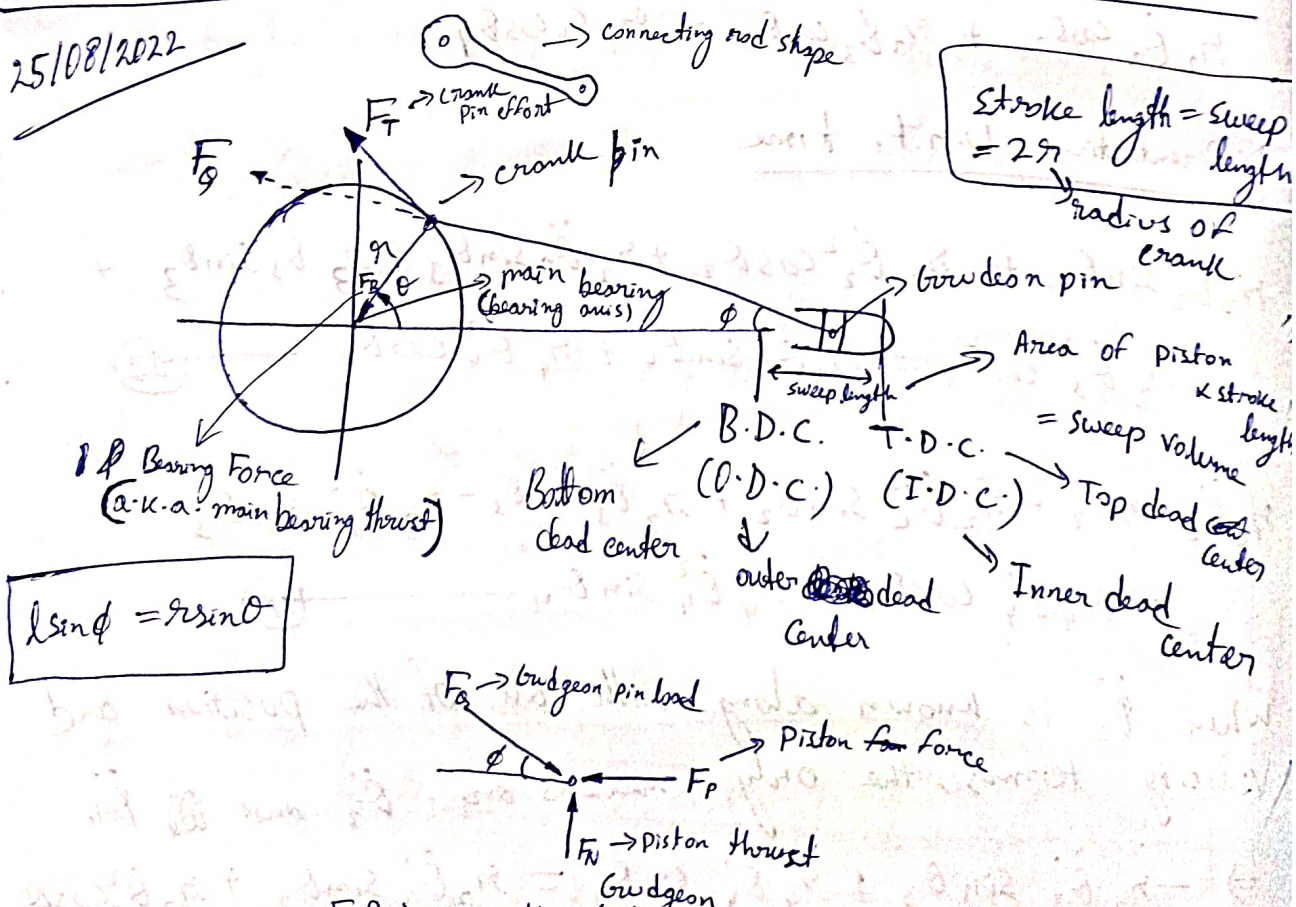
II) If $\dot{\theta}_2 = 10$ rad/sec and $\ddot{\theta}_2 = 0$, compute $\dot{\theta}_3$, $\dot{\theta}_4$ and $\ddot{\theta}_3$ and $\ddot{\theta}_4$

Rough

Find loop closure equation in scalar form

1st ~~assignm~~ assignment (A4 Page) ↑

25/08/2022



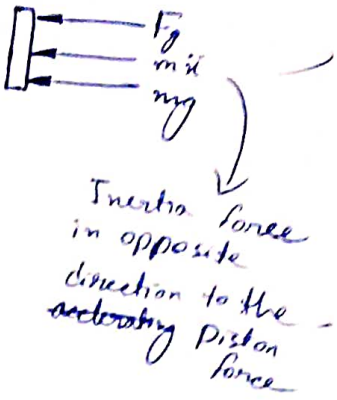
F.B.D. of the ~~Gudeon~~ pin (in Dynamic equilibrium)

$F_P = F_g + mi + mg$ → mass of slider (piston)

→ = 0 for horizontal engine

Inertia Force

$\frac{\pi D^2}{4} \times p$ ↓ Pressure



Inertia force in opposite direction to the ~~accelerating~~ Piston force

From Sine rule

$$\frac{F_P}{\sin(90+\phi)} = \frac{F_Q}{\sin 90^\circ} = \frac{F_n}{\sin(180^\circ-\phi)}$$ } use these to solve questions

$$F_S = F_P \cdot \frac{n}{\sqrt{n^2 - \sin^2\theta}}$$ [n = ~~crank~~ crank ratio]

$$\& \quad F_N = F_P \cdot \frac{\sin\theta}{\sqrt{n^2 - \sin^2\theta}}$$

→ Probable question

Q) Derive the expression for F_Q and F_N from θ.

- $F_T = F_Q \sin(\theta+\phi)$

  $F_B = F_Q \cos(\theta+\phi)$

- $F_T = F_P \sin\theta \left[1 + \frac{\cos\theta}{\sqrt{n^2 - \sin^2\theta}}\right]$

  $F_B = \left[\cos\theta - \frac{\sin^2\theta}{\sqrt{n^2 - \sin^2\theta}}\right]$

Q) Derive F_T and F_B in terms of F_P

- Crank effort → Turning moment i.e. torque

  $T = F_T \cdot r$ (↺)

  T ↙ Torque

- Go through problems

If ans starts with 1 then round upto 4 places → 132.8 N

for any other digit round upto 3 digits

N, MN, KN, Use multiplicative terms for higher numbers

* Solution not more accurate than the data given in question

*** Always Draw figure in Answer and write in S.I. unit and the direction of Force