Flywheel Design

Problems in (2) types → Engine
Punching Machine

(1) Engine type

Formulas → $\Delta E = E_{max} - E_{min}$

$\Delta E = E \times 2 C_s$

C_s → Co-efficient of fluctuation

$$m = A \times \pi \times D \times e$$

$$\sigma_t = e v^2$$

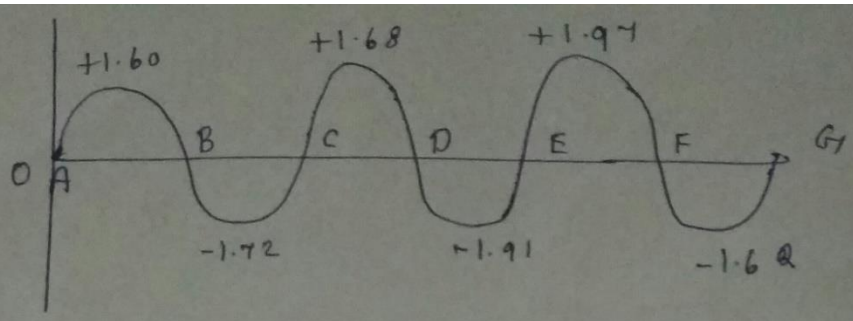
$$E = \frac{1}{2} m v^2$$

$$V = \frac{\pi D N}{60}$$

$$m = A \times \pi \times D \times e$$

$$\Rightarrow A = b \times h \qquad (\because b = 2h)$$

(1) A multi Cylinder engine is to have Constant load and run at 500 rpm on the Crank effort drawing of Scale 1 cm = 2500 Nm & 1 cm = 60°. The area above and below the mean torque are measured in order +1.60, −1.72, +1.68, −1.91, +1.97, −1.62. $C_s = 0.02$, $e = 7200 kg/m^3$, $\sigma = 6 MPa$.



$\Delta E = E_{max} - E_{min}$

Energy at $A = E$

$B = E + 1.60$

$C = E + 1.60 - 1.72$

$= E - 0.12$

$D = E - 0.12 + 1.68$

$= E + 1.56$

$E = E + 1.56 - 1.91$

$= E - 0.35$

$F = E - 0.35 + 1.97$

$= E + 1.62$

$G = E$

$\Delta E = E_{max} - E_{min} = (E + 1.62) - (E - 0.35)$

$= 1.97 \times$ (Scaling)

$\Delta E = 5157.4$ N-m. (4754.311-m) ↓

$1\,cm^2 = 60 \times \pi / 180 \times 2500$

$= 2617.99$

$\Delta E = E \times 2 C_g (0.02)$

$E = 128935$ N-m

$\sigma_t = \rho V^2 \Rightarrow V = 28.87 \text{ m/s}$

$\Rightarrow E = \frac{1}{2} mv^2$

$128935 = \frac{1}{2} m (28.87)^2$

$m = 310 \text{ kg}.$

$V = \pi DN/60 \Rightarrow D = 1.1 \text{ m}$ (450 rpm)

$m = A \times \pi \times D \times \rho$

$310 = 2 h \times h \times \pi \times 1.1 \times 7200$

$h = 78 \text{ mm}$,

$b = 2h = 156 \text{ mm}$ ///