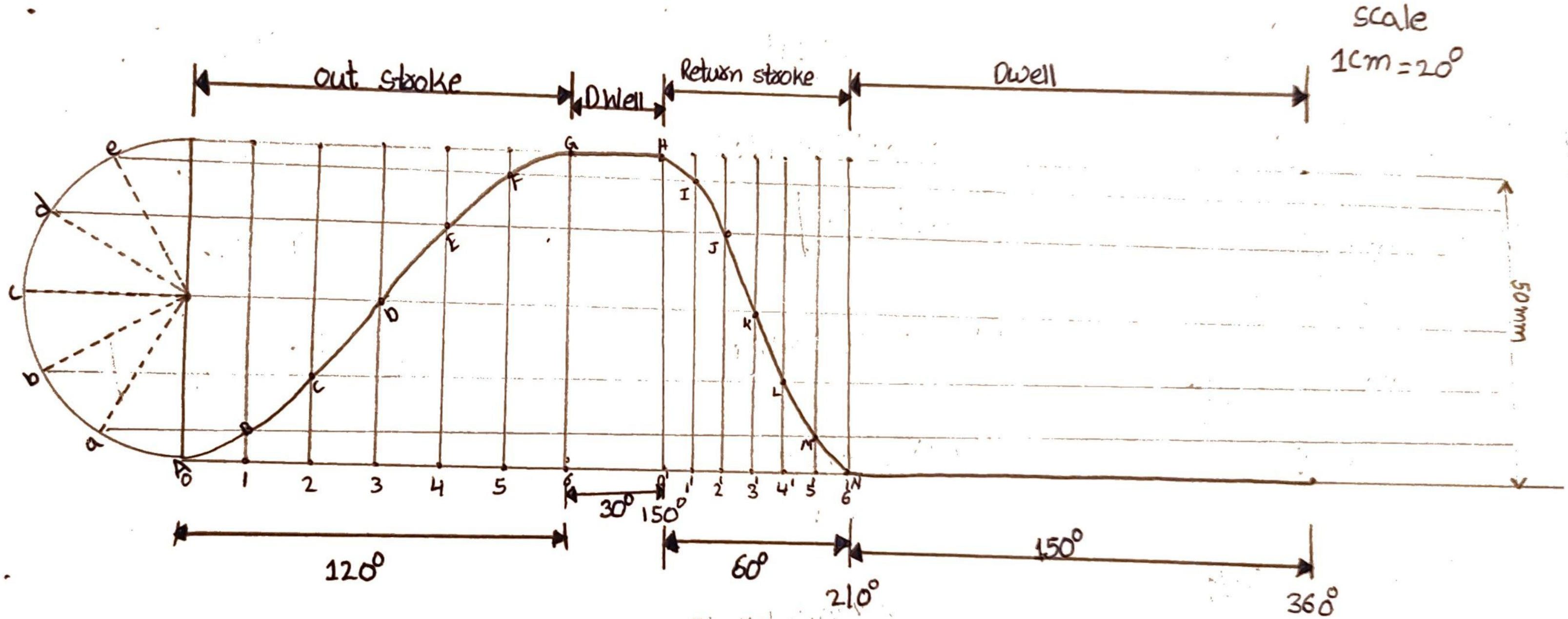
Q1

Given Data:-

Lift = 50 mm , $\frac{1}{3} \times 360^\circ = 120^\circ$ = out stroke , $\frac{1}{12} \times 360^\circ = 30^\circ$ = Dwell , $\frac{1}{6} \times 360^\circ = 60^\circ$ = Return stroke , 150° = Dwell

Roller diameter = 20mm , min radius of cam = 25cm , Diameter of cam shaft = 25mm



Angular velocity

$$\omega = \frac{2\pi \times RPm}{60}$$

$$\omega = \frac{2\pi \times 100}{60}$$

$$\boxed{\omega = 10.47 \text{ rad/s}}$$

During Raising

$$V_{max} = \frac{\pi \omega S}{2\theta}$$

$$= \frac{\pi \times 10.47 \times 50}{2 \times \frac{2\pi}{3}}$$

$$= 392.62 \text{ mm/s}$$

$$\boxed{= 0.392 \text{ m/s}}$$

$$a_{max} = \frac{\pi^2 \omega^2 S}{2\theta^2}$$

$$= \frac{\pi^2 \times (10.47)^2 \times 50}{2\left(\frac{2\pi}{3}\right)^2}$$

$$= 6166.17 \text{ mm/s}^2$$

$$\boxed{= 6.16 \text{ m/s}^2}$$

During lowering

$$V_{max} = \frac{\pi \omega S}{2\theta}$$

$$= \frac{\pi \times 10.47 \times 50}{2 \times \pi}$$

$$= 785.25 \text{ mm/s}$$

$$\boxed{= 0.785 \text{ m/s}}$$

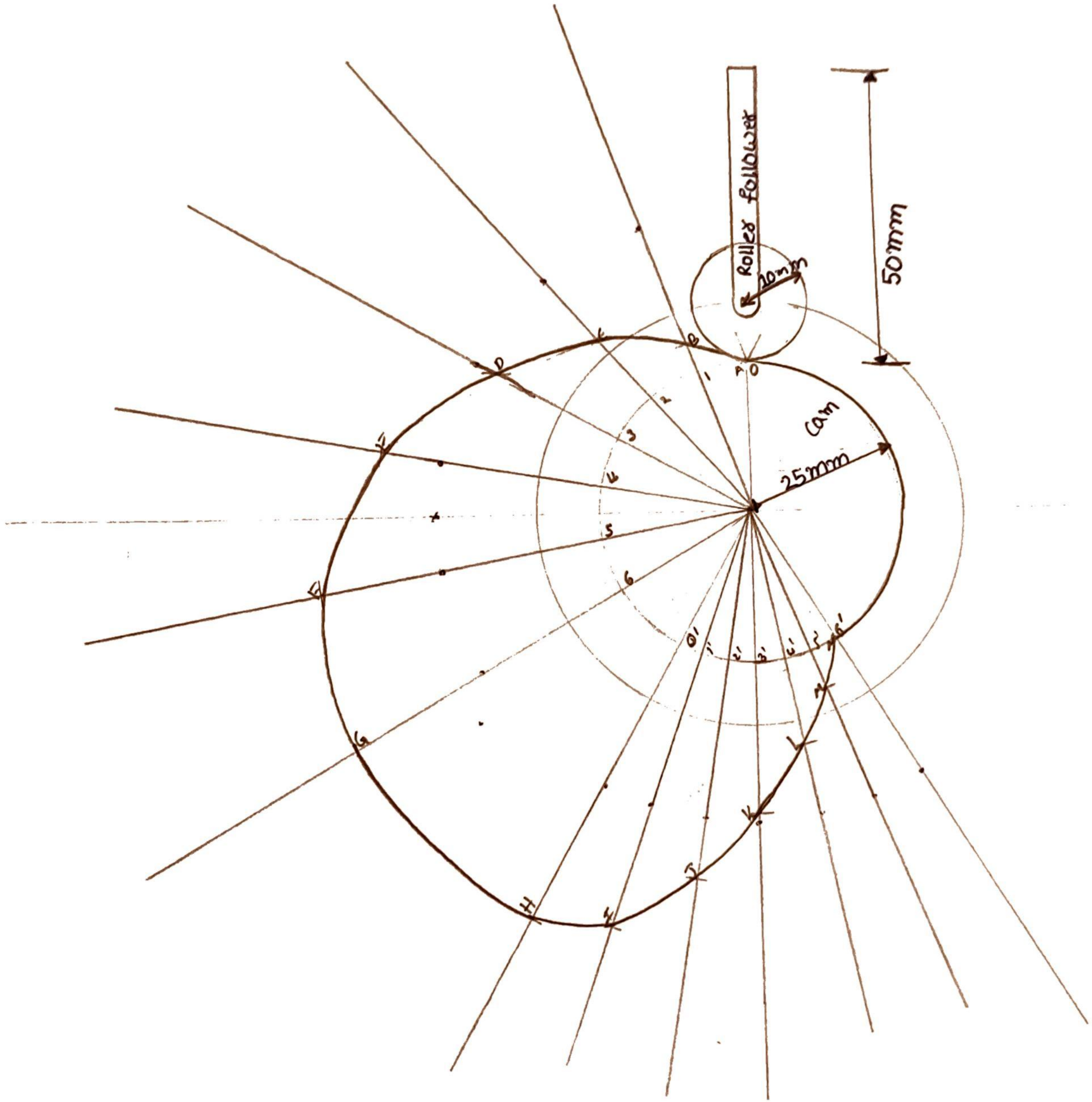
$$a_{max} = \frac{\pi^2 \omega^2 h}{2\theta^2}$$

$$= \frac{\pi^2 (10.47)^2 \times 50}{2\left(\frac{\pi}{3}\right)^2}$$

$$= 24664.707 \text{ mm/s}^2$$

$$\boxed{= 24.66 \text{ m/s}^2}$$

Cam profile



(Q2)

Given Data:-

cam is rotating clockwise with 100 rpm | Radius of cam = 50 mm

a) Follower move outwards = 25 mm at 120°

b) dwell for next 60°

c) To Return its starting position during next 90°

d) Rest follower is dwell

height of follower = 25 mm

Angular velocity $\omega = \frac{2\pi \times rpm}{60}$ rad/s

$= \frac{2 \times 3.14 \times 100}{60}$

$\boxed{\omega = 10.47 \text{ rad/s}}$

a) $\theta_{outward} = \theta° \times \frac{\pi}{180} = 120° \times \frac{\pi}{180} = 2.1 \text{ rad}$

dwell = 60°

$\theta_{desent\ (or)\ return} = 90° \times \frac{\pi}{180} = 1.57 \text{ rad}$

uniform Acceleration & retardation.

$V_{max} = \frac{2\omega s}{\theta_a}$ $\quad a_{max} = \frac{4\omega^2 s}{\theta^2}$

θ_a = out stroke

θ_w = return stroke

out stroke

$$V_{max} = \frac{2h\omega}{\theta_a}$$

$$V_{max} = \frac{2 \times 25 \times 10.47}{2.1}$$

$$= 249.28 \text{ mm/s}$$

$$\boxed{V_{max} = 0.25 \text{ m/s}}$$

$$a_{max} = \frac{4S\omega^2}{\theta^2}$$

$$a_{max} = \frac{4 \times 25 \times (10.47)^2}{(2.1)^2}$$

$$= 2485 \text{ mm/s}^2$$

$$\boxed{a_{max} = 2.5 \text{ m/s}^2}$$

Return stroke

$$V_{max} = \frac{2S\omega}{\theta_a}$$

$$= \frac{2 \times 25 \times 10.47}{1.57}$$

$$= 333.43 \text{ mm/s}$$

$$\boxed{V_{max} = 0.33 \text{ m/s}}$$

$$a_{max} = \frac{4S\omega^2}{\theta^2}$$

$$= \frac{4 \times 25 \times (10.47)^2}{(1.57)^2}$$

$$= 4447.27 \text{ mm/s}^2$$

$$\boxed{a_{max} = 4.4 \text{ m/s}^2}$$

Rough Diagrams.