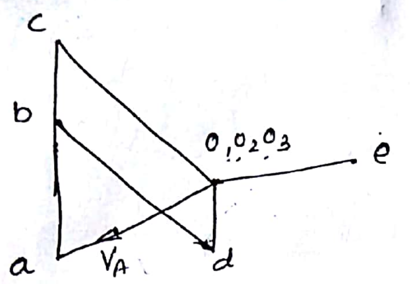
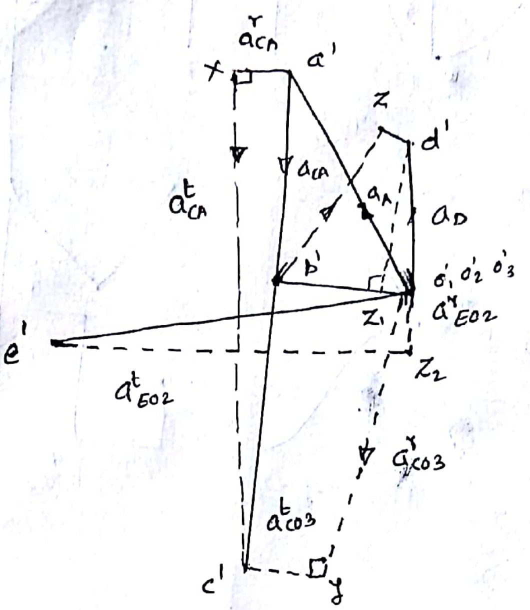
SE / sem IV / CBSGS / MECH / AUTO / TOM - I / M-J.18   016049

Q. 2 a) $V_{OA1} = V_A = \omega_{AO1} \times O_1A = 100 \times 0.1 = 10\ m/s$





V_{CA} = vector ac = 7 m/s

$V_{CO3} = V_c = 10\ m/s$

$V_{DB} = 10.2\ m/s$

$a^r_{AO1} = \frac{V^2_{AO1}}{O_1A} = 1000\ m/s^2$

$a^r_{CA} = \frac{V^2_{CA}}{AC} = \frac{7^2}{0.7} = 70\ m/s^2$

$a^r_{CO3} = 500\ m/s^2$, $a^r_{DB} = 693.6\ m/s^2$

Vector $a'x = a^r_{CA} = 70\ m/s^2$

Vector $O_3'y = a^r_{CO3} = 500\ m/s^2$, vector $b'z = a^r_{DB} = 693.6\ m/s^2$

$a_E = a_{EO2}$ = vector $= o_2'e' = 1200\ m/s^2$

angular accn of the bell crank lever

a^t_{DO2} = vector $z_1d' = 610\ m/s^2$

∴ Angular accn of the bell crank lever

$= \frac{a^t_{DO2}}{O_2D} = \frac{610}{0.2} = 3050\ rad/s^2$ (↻)

—x—x—

Q 4 a)   max^m tension in the belt, $T = \sigma bt = 2 \times 10^6 \times 0.1 \times 0.006 = 1200\ N$

Mass of the belt per meter length, m = Area x length x density $= b \cdot t \cdot 1 \cdot \rho$

$= 0.1 \times 0.006 \times 1 \times 1000 = 0.6\ kg/m$

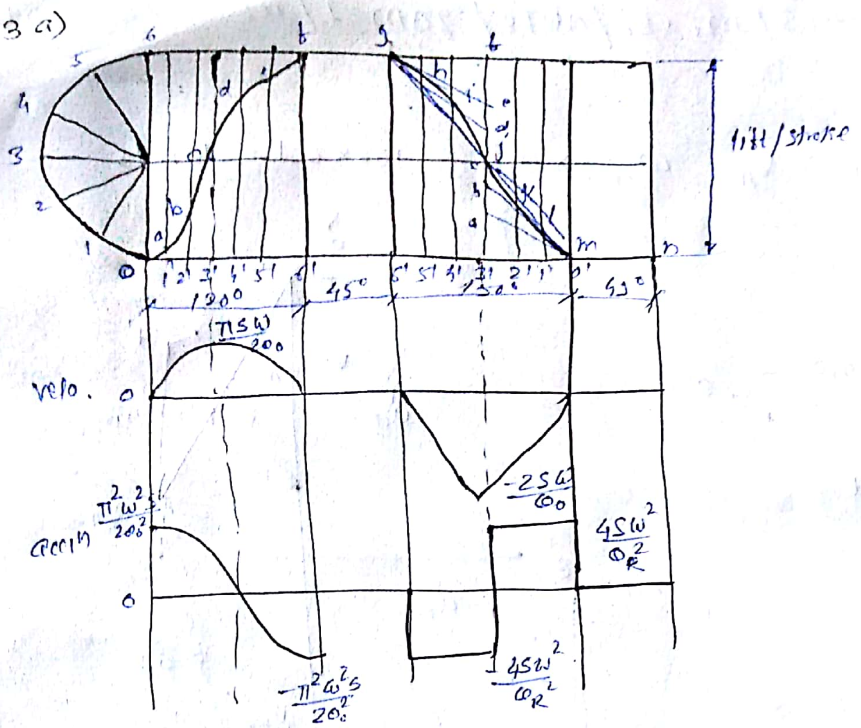
∴ speed of the belt for greatest power, $V = \sqrt{T/3m} = 25.82\ m/s$

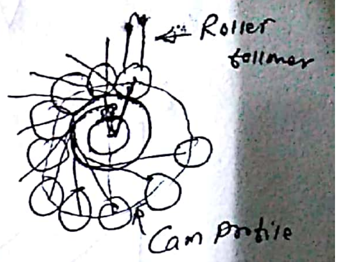
max^m power to be transmitted, centrifugal tension,

$T_c = T/3 = 400\ N$, $T_1 = T - T_c = 800\ N$, $\frac{T_1}{T_2} = e^{\mu\theta}$

$P = (T_1 - T_2)V = (800 - 425.5)\,25.82 = 9.67\ KW$.

Q. 3 (a)





Q. 5(a) $\quad m = \frac{d}{T_P}$, $T_P = 20$ also $m = \frac{D}{T_G}$, $T_G = 70$

$$G = \frac{T_G}{T_P} = 3.5 \quad , \quad T_G = \frac{2 \cdot A_W}{\left[\sqrt{1 + \sin^2\phi \cdot \frac{1}{G}\left(\frac{1}{G}+2\right)} - 1\right]}$$

$A_W = 1.31$

$a_p = a_w = A_W \cdot m = 1.31 \times 5$

$a_p = a_w = 6.56$ mm

Contact ratio

$r_A = r + a_p = 50 + 6.56 = 56.56$ mm

$R_A = 181.56$ mm

$$l.o.P.o.A. = \sqrt{R_A^2 - R^2 \cos^2\phi} - R\sin\phi$$
$$= 17.1 \text{ mm}$$

$$l.o.P.o.R. = \sqrt{r_A^2 - r^2 \cos^2\phi} - r\sin\phi$$
$$= 14.39 \text{ mm}$$

$l.o.P.o.C = 17.1 + 14.39 = 31.49$ mm

$$C.R. = \frac{l.o.P.o.C.}{\cos\phi} \times \frac{1}{\pi m}$$
$$= \frac{31.49}{\cos(20^0)} \times \frac{1}{\pi \times 5} = 2.13 \simeq 3$$

Scanned by CamScanner

velocity of sliding

$$G = \frac{\omega_1}{\omega_2} \quad , \quad 3.5 = \frac{10.47}{\omega_2}$$

$$\omega_2 = 2.99 \text{ rad/s}$$

$$V_{SF} = (\omega_1 + \omega_2) \times \text{I.O.P.O.A.}$$

$$= (10.47 + 2.99) \times 17.1$$

$$= 0.23 \text{ m/s}$$

velo. at the end of contact

$$V_{SE} = (\omega_1 + \omega_2) \times \text{I.O.P.O.R}$$

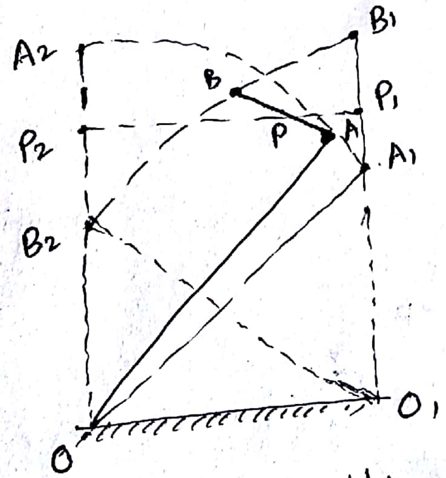
$$= (10.47 + 2.99) \times 14.39$$

$$= 0.19 \text{ m/s.}$$

——x——x——x——

Q. 2 b) Beam Engine, Coupling rod of locomotive, Watt's Indicator mechan

Q. 1 b)



Tchebicheff's mechanism