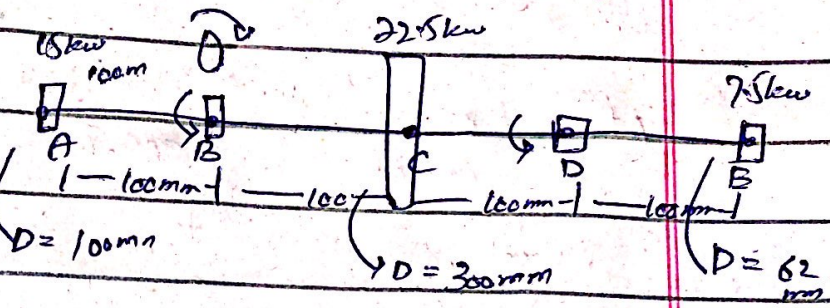
0.1047 2022-MC-58

Rpm = 480 rpm = 50.256 rad/s

Now

$P = T\omega$



At (A)

$\frac{15 \times 10^3}{50.256} = T_A = 298.471$ Nm

At (C)

$\frac{22.5 \times 10^3}{50.256} = 447.7$ Nm

At (E)

$\frac{7.5 \times 10^3}{50.256} = 149.23$

Now at (A)

$T = rf$, $W_t = \frac{T}{r} = \frac{298.471}{0.05} = 5960$N

W_t

$W_r = 5960 \tan(20^\circ)$ — assume Min No. of teeth (18)

$= 2169$N

at (C)

$W_{tc} = \frac{T_c}{r_c} = \frac{447.7}{0.150} = 2984.66$N

$W_{rc} = 2984.6 \tan(20^\circ) = 1086.32$N

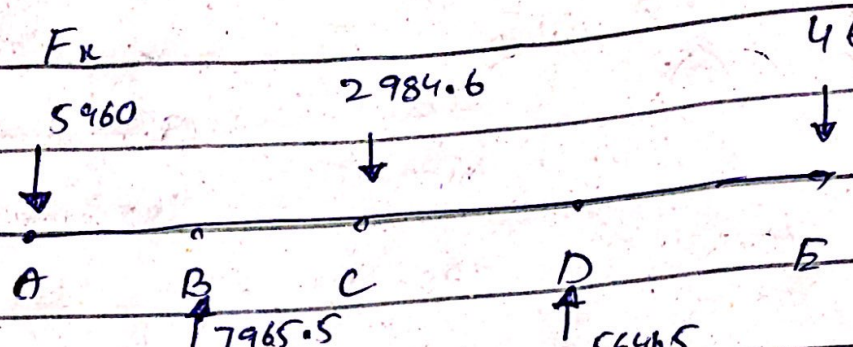
at (E)

$W_{tE} = \frac{T_E}{r_c} = \frac{149.23}{0.032} = 4663$N

$W_{rE} = 4663 \tan(20^\circ) \rightarrow 1697.35$N

Taking downward forces positive ↓ +

→ At Fx



Now ΣM at B = 0

assume ↻ clockwise +ve

$0 = -(5960 \times 0.1) + (2984 \times 0.1) - (0.2 \times D) + (4663 \times 0.3)$

$= -569 + 298.4 - 0.2D + 1398.9$

$0.2D = 1128.3$

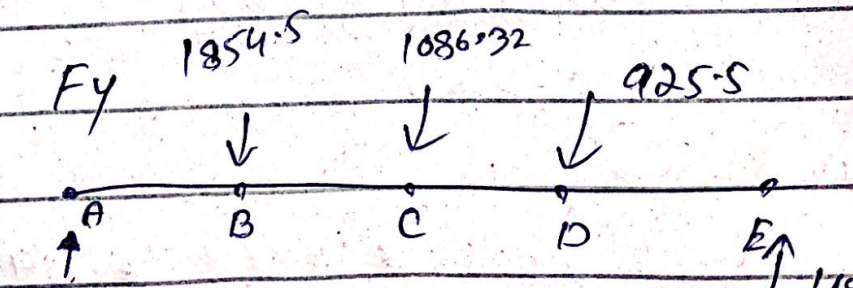
$D = \frac{1128.3}{0.2} = 5641.5\ N$

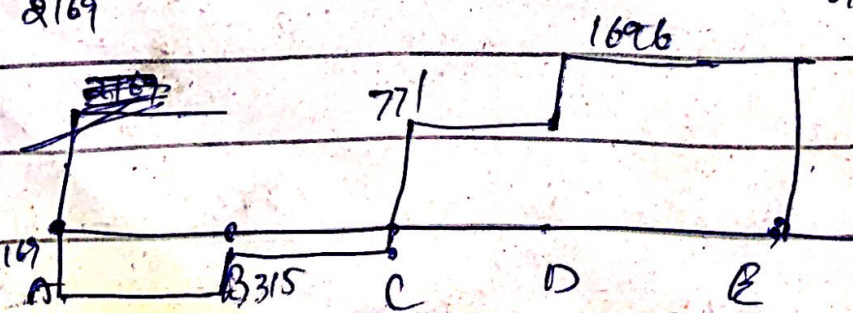
$\Sigma F = 0$ ↑

$5960 + 2984.6 + 4663 - B - 5641.5 = 0$

$B = 7965.5$

→ Taking Fy





again $\Sigma M_B = 0$

$0 = (2169 \times 0.1) + (0.1 \times 10832) + (0.2 \times D) - (0.3 \times 16928)$

$= 216.9 + 108.6 + 0.2D - 509$

~~$0 = 578.775$~~

$D = 925.5$

$\Sigma F = 0$

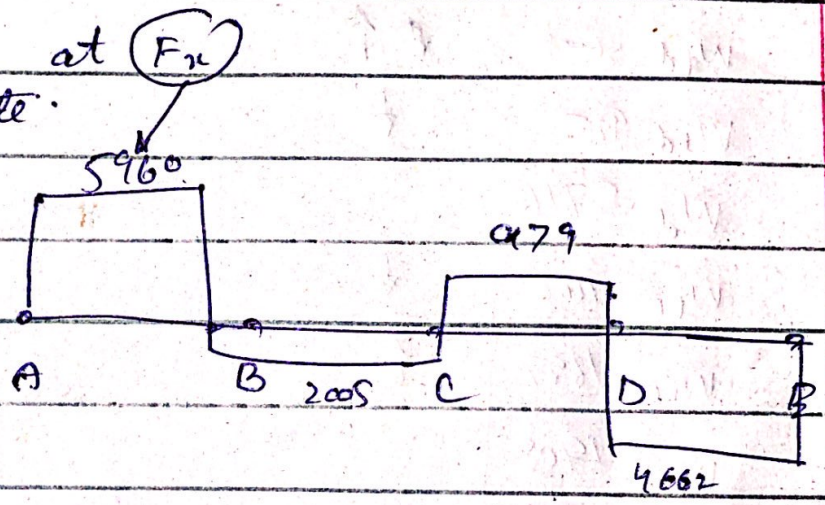
$925.5 + 1086.32 - 1697.35 = 2169 + B$

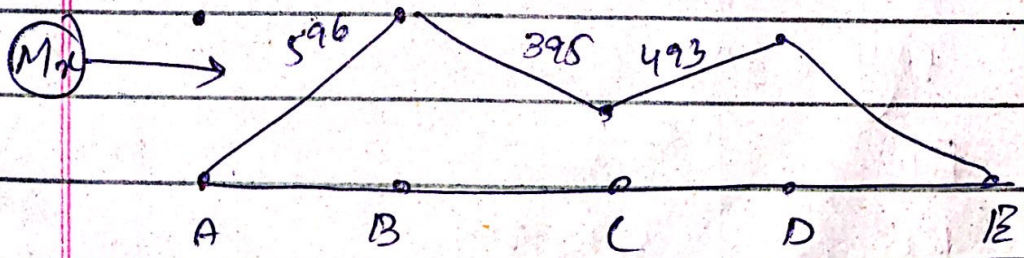
$B = 1854.5\ N$

Now,

at F_x

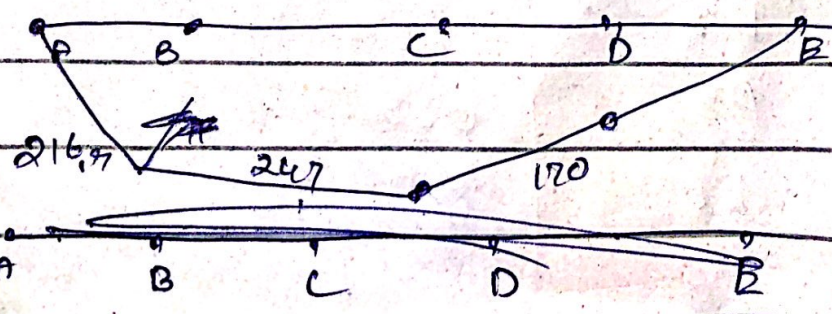
~~Table~~.





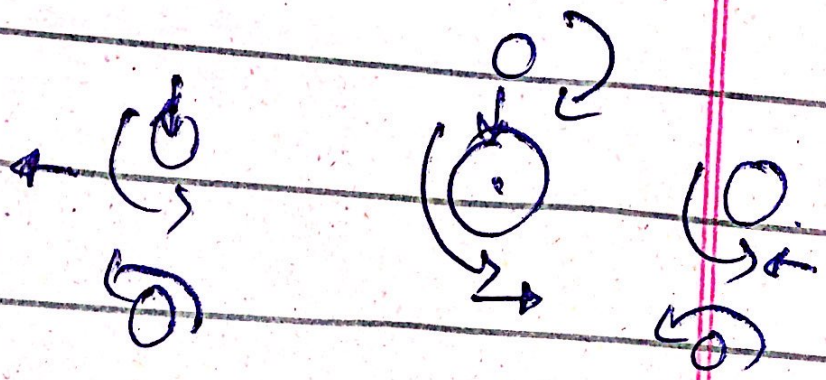
My

For



steel :

$K_t = 2.5$



Now chosing Rock Crusher and driver as motor Ko evalues as 1.75

Now

$P_{des} = 1.75 \times 22.5 = 39.375 \text{ kw}$ → get

$P_{des_A} = 15 \times 1.75 = 26.25 \text{ kw}$

$P_D = 4$

$P_{des_B} = 7.5 \times 1.75 = 13.125 \text{ kw}$

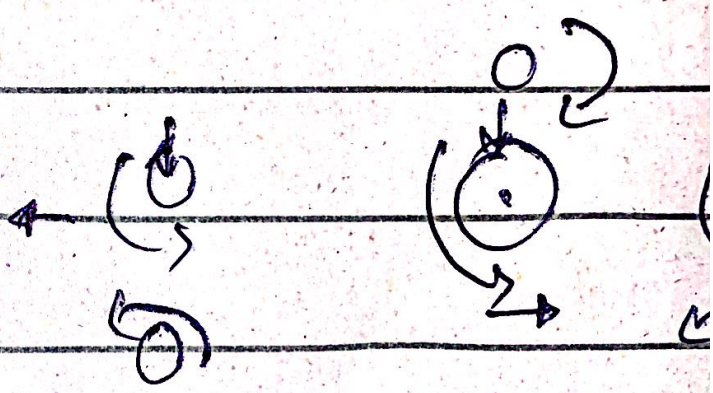
Now lets get Diameter of Shaft.

$$D = \left[\frac{32N}{\pi}\sqrt{\left(\frac{K_t M}{S_n}\right)^2 + \frac{3}{4}\left(\frac{T}{S_y}\right)^2}\right]^{1/3}$$

using $N = 3$ Design factor.

considering steel:

$K_t = 2.5$



Now chosing Rock Crusher and obtain as motor K_o evalues as 1.75

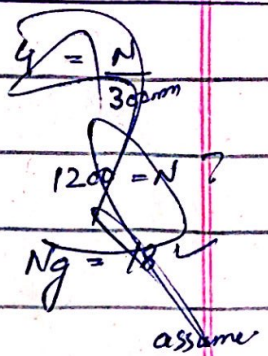
Now

$P_{des} = 1.75 \times 22.5 = 39.375$ kw → get

$P_{des_A} = 15 \times 1.75 = 26.25$ kw

$P_{des_B} = 7.5 \times 1.75 = 13.125$ kw

Pd = 4 , m = 6 from table.



V.R = $\frac{P_{out}}{P_{in}}$ = $\frac{1}{1}$

V.R = $\frac{18}{22.5}$ = 1.5

V.R = = 3

Ng = 18
Np = 27

Say Ng = 18

Then Np = 84

Say material 4140 OQT 1000

S_u = 1160 mpa , S_y = 1050 mpa

Now

S_n = (0.80)(0.81)(400mPa) = 259 MPa = 259 N/mm²

K_s = 0.80)

K_r = (0.81) k_r = Reliably

J = 0.31

Now Pd = 400m

Ng = 120

F = $\frac{1P}{Pd}$ = 3

Say motor rotates on 3000rpm

$\frac{3000}{480}$

22 65 45

965

	F		Direc
~~Wt~~	5900	↓	596
Wt A	2169	↑	~~395~~
→ WA	6342		
WtB	7965	↑	395
WrB	1854	↓	
→ WB	8177		
Wtc	2984	↓	493
Wrc	1086	↓	
→ Wc	3175		
Wtd	5641	↑	
Wrd	925	↓	
→ Wd	5716		
WtE	4663	↓	
WrE	1697	↑	
→ WE	4905		

~~SDE 4140~~

		Wt	
D1	21.56		22
D2	53.13	2.5	55 × 1.06 = 63.8 (65)
D3	62.26	1.5	
D4	62.82	2.5	
D5	56.69	3.0	1.06 = 63.8

in selfwork forget

D7 = 60
D8 = 55
D9 = 45