

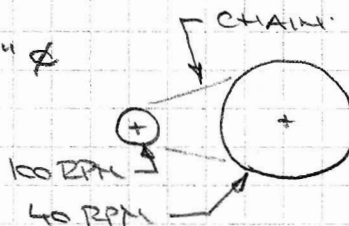
MECH 153 - ASSIGNMENT 3 SOLUTION

#1 DRIVER → 5HP, 100 RPM, 1.75" Ø HEAVY SHOCK.
ELECTRIC MOTOR.

DRIVEN → 5HP, 40 RPM, 2" Ø

C/C → 36"

SINGLE CHAIN.



① $REQ^D HP = \frac{HP \times SF}{MSF} = \frac{5 \times 1.5}{1} = 7.5 \text{ HP.}$

② FIG 20-16 → 100 RPM, 7.5HP → 80 CHAIN.
1" PITCH

③ TABLE 20-11 → 1" PITCH, 100 RPM, 7.81 hp → 24 TEETH.

④ $\frac{n_1}{n_2} = \frac{N_2}{N_1} \therefore N_2 = N_1 \left(\frac{n_1}{n_2} \right) = 24 \left(\frac{100}{40} \right) = 60$

⑤ TABLE 20-13 → 60 TEETH ON DRIVEN IS PERFECT

⑥ TABLE 20-12 → 1" PITCH, 24 TEETH → MAX BORE = 4.56"

⑦ $C = \frac{36}{1} = 36$ $F = 60 \cdot 24 = 360$ $L = 2C + \frac{M}{2} + \frac{S}{C}$ $\therefore 1.75" \text{ OR } 2(36) + 42 + 0.9119 = 114.9 = 115 \text{ LINKS} = 115"$
 $M = 60 + 24 = 84$ $S = 32.83$ T20-6

#2 (LIKE #1 BUT DOUBLE CHAINS)

BUT MUST BE EVEN NUMBER

① $REQ^D HP = \frac{5 \times 1.5}{1.7} = 4.4 \text{ hp / CHAIN.} \therefore 116 \text{ LINKS} = 116"$

② 60 CHAIN. 0.75" PITCH.

③ 0.75", 100 RPM, 4.56 hp → 32 TEETH.

④ 80 TEETH ON DRIVEN. (SEE ABOVE FOR EQUATIONS AND TABLE REFERENCES).

⑤ 80 TEETH IS PERFECT.

⑥ 32 TEETH OFF TABLE BUT SINCE 25 TEETH HAS MAX BORE OF 5.16" THEN 32 TEETH WILL FIT 1.75" Ø SHAFT.

⑦ $C = \frac{36}{0.75} = 48$

$M = 32 + 80 = 112$

$F = 80 - 32 = 48$

$S = 58.36$

$L = 2(48) + 56 + 1.049$

$= 153.05 \text{ LINKS (BUT MUST BE EVEN).}$

$= 154 \text{ LINKS} = 115.5" \text{ LONG CHAIN.}$

#3 DRIVER: 5.6 KW, AT 100 RPM
 WITH 44 mm ϕ SHAFT.
 DRIVEN: 66 RPM WITH 50 mm ϕ SHAFT.

$$C/C = 1055 \text{ mm.}$$

3 CHAIN ARRANGEMENT.

MODERATE SHOCK.

ASSUME: ELECTRIC MOTOR.

$$\textcircled{1} \text{ REQ}^D = \frac{HP \times SF}{MCF} = \frac{5.6 \text{ kW} \times 1.3}{2.5} = \underline{2.912 \text{ kW.}}$$

$\textcircled{2}$ #60 CHAIN, 20 mm PITCH.

$\textcircled{3}$ TABLE 20-9: 100 RPM, 3.0 kW \rightarrow 28 TEETH

$$\textcircled{4} N_2 = N_1 \left(\frac{N_1}{N_2} \right) = 28 \left(\frac{100}{66} \right) = 42.42 \text{ TEETH.}$$

$\textcircled{5}$ T20-13 \rightarrow USE 42 OR 43 TEETH ON DRIVEN.

$$N_2 = N_1 \left(\frac{N_1}{N_2} \right) \rightarrow N_2 = 100 \left(\frac{28}{42} \right) = 66.7 \text{ RPM.}$$

$$\text{OR } N_2 = 100 \left(\frac{28}{43} \right) = 65.1 \text{ RPM.}$$

USE 43 TEETH AS IT IS 1 RPM OFF

$\textcircled{6}$ TABLE 20-12 \rightarrow 25 TEETH HAS MAX BORE = 86

\therefore 28 TEETH WILL FIT 44 mm ϕ SHAFT.

$$\textcircled{7} C = \frac{1055}{20} = 52.75 \text{ PITCHES}$$

$$M = 43 + 28 = 71$$

$$F = 43 - 28 = 15 \rightarrow \text{USING TABLE 20-6}$$

$$S = 5.70$$

$$L = 2(C) + \frac{M}{2} + \frac{S}{C}$$

$$= 2(52.75) + \frac{71}{2} + \frac{5.70}{52.75}$$

$$= 141.1 \text{ PITCHES}$$

$$= \underline{142 \text{ PITCHES}} \rightarrow \underline{2822.2 \text{ mm CHAIN}}$$