

4 concl'd

length factor = 1.00
 \therefore drive capacity = $6.36 \times 0.95 \times 1.00 = 6.04 \text{ kW}$.

(b) $\phi = \sin^{-1} (D_2 - D_1) / 2C = \sin^{-1} 0.149 = 0.150$

The small pulley will be limiting, so

$k_0 = 1 - \exp(-\phi)_{\text{small}} = 1 - \exp(-0.512(\pi - 2\phi)) = 0.767$

$v = \pi d n = \pi \times 0.2 \times 1440 / 60 = 15.1 \text{ m/s}$

Evaluating the terms in (5a):-

$P / k_0 v z = 6040 / (0.767 \times 15.1 \times 1) = 522 \text{ N}$

$F v^2 = 0.1666 \times 15.1^2 = 38 \text{ N}$

- so (5a) takes the form:-

$L / \pi T = [(P / k_0 v z + M / d + F v^2) / F]^m + [(P / k_0 v z + M / D + F v^2) / F]^m$

$2.3 / 15.1 T = [(522 + 62.72 / 0.2 + 38) / 5535]^{11.1} + [(522 + 62.72 / 0.4 + 38) / 5535]^{11.1}$

$\therefore T = 111 \text{ Ms} = 30.8 - \text{say } 31 \text{ khr}$

(c) P must be found from (5a) with given T = 93.6 E6 s.

Substitute $P / k_0 v z F = x$, and (5a) becomes:

$[x + (62.72 / 0.2 + 38) / 5535]^{11.1} + [x + (62.72 / 0.4 + 38) / 5535]^{11.1} = L / \pi T = 2.3 / 15.1 \times 93.6 \text{ E}6 = 1.63 \text{ E}-9$

or $(x + 0.06355)^{11.1} + (x + 0.03517)^{11.1} = 1.63 \text{ E}-9$

Which, by trial-and-error, has solution $x = 0.09676$

whence $P = x k_0 v z F = 0.09676 \times 0.767 \times 15.1 \times 1 \times 5535$

i.e. $P = 6.19 \text{ kW}$.

(d) see below

(e) Design power = $12 \times 1.3 = 15.6 \text{ kW}$

using result of (c) above, the rating of a single belt is 6.19 kW. So number of belts = $15.6 / 6.19 = 2.5$

(or, from (c) $P = x k_0 v z F$

$\therefore 15.6 = 0.09676 \times 0.767 \times 15.1 \times z \times 5.535 \Rightarrow z = 2.5$)

(f) as above procedure, solving (5a) for T.

 V-BELTS

 V-Belt Drive Selection
 to AS 2784-1985
 - version 1

Enter - drive title : Problem 4d
 - design power (kW) : 6.19
 - driving speed (rpm) : 1440
 - driven speed limits (rpm) : 719 721
 - centre distance limits (mm) : 670 672
 - drive life limits (khr) : 0 0
 - is the large pulley flat ? :

Belt & number	Pulley diameters mm	Output speed rpm	Belt speed m/s	Belt length mm	Centres mm	Belt life khr	Eff %
B 1	200 400	720	15.1	2300	671	26.0	64

End of program

 V-BELTS

 V-Belt Drive Selection
 to AS 2784-1985
 - version 1

Enter - drive title : Problem 4f
 - design power (kW) : 15.6
 - driving speed (rpm) : 1440
 - driven speed limits (rpm) : 719 721
 - centre distance limits (mm) : 670 672
 - drive life limits (khr) : 1 150
 - is the large pulley flat ? :

Belt & number	Pulley diameters mm	Output speed rpm	Belt speed m/s	Belt length mm	Centres mm	Belt life khr	Eff %
A 3	200 400	720	15.1	2300	671	4.8	79
4						53.2	74
B 2	200 400	720	15.1	2300	671	5.0	69
3						82.3	59

End of program

The advantages of the code approach, when software like 'V-Belts' is not available, should now be obvious!!