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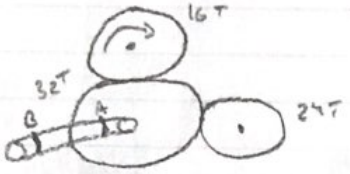
Machine elements HW7 March 24, 2020

Problem 2:



Given: $P = 8$, $\phi = 20°$, $\varepsilon = 100\%$

$\omega = 1500 \text{ rpm} \cdot \frac{2\pi}{60} = 157.0975 \text{ rad/s}$

$T = 90 \text{ lb·in}$

a. $F_r = F_t \tan\phi$ $\quad F_t = \frac{T}{r_p}$ $\quad r_p = \frac{N_p}{2P} = \frac{16}{2(1)} = 1$

$F_t = \frac{90}{1} = 90 \text{ lbs.}$ $\quad F_r = 90 \tan 20° = 32.76 \text{ lbs.}$

$90 + 32.76 = 122.76 \text{ lbs.} \rightarrow N_{out}$ $\quad \Sigma M_B = (N_{out})5 - R_A(4) = 0$

$R_A = 217 \text{ lbs}$

$\Sigma F_y = N_{out} + R_B - R_A = 0$

$R_B = 43.4 \text{ lbs}$

b. Now spinning in opp. Direction so.

$F_r = 90 - 32.76 = 57.24 \text{ lbs.}$

$N_{out} = \sqrt{2 \cdot 57.24^2} = 80.95.$

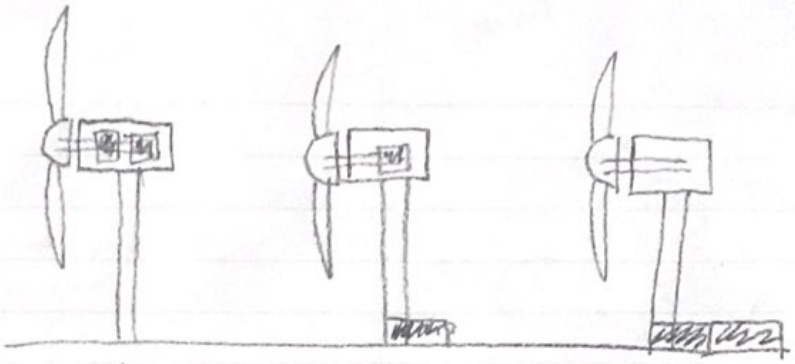
$\Sigma M_B = (N_{out})5 - R_A(4) = 0$ $\quad \Sigma F_y = N_{out} + R_B - R_A = 0$

$R_A = 101.2 \text{ lbs.}$ $\quad R_B = 20.23 \text{ lbs.}$

c. They are Diff, b/c of the way the gear is rotating. ~~the~~ when spinning counter clockwise ~~its~~ the force goes against the ~~force~~ force, and visa-versa.

d. The 16 Teeth gear would fail first because it would have to go through more rotations than the other gears causing more wear on the parts.

Problem 3

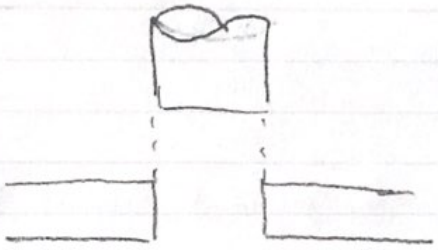


Part 1:	A	B	C
Stress on Tower	- Heavy on TOP Could cause bending/ Stress in Tower	- Less heavy on TOP So Less Stress Then A	- Least Stress of The 3 Towers
Convience of maintenence	Not convenient X	Half convienent -	Most convienent ✓
Performance	would be best At Converting wind into electricity.	Okay at converting wind into energy	Worst At converting wind into Energy
Bearing / Shaft Placement	Placement is good for converting Energy.	placement would Lose energy	placement would Lose energy.

Part 2: The Load on The Vertical Shaft would cause Axial Loading and bending. Also The rotation of The blades could cause Torsion.

Part 3: A would be The best choice if Looking at converting wind Energy To electricity.

Problem 4 Find hole / shaft Limits for a Sliding fit using a basic hole size of 1 in.



Sliding fit -> H7 / g6

hole -> 1 in and Tolerance of 0.0008 from chart and H7.

So $D_{max} = 1 + 0.0008 =$ **1.0008 in**

$D_{min} = 1 - 0.0008 =$ **0.9992 in**

shaft -> 1 in and Tolerance of 0.0003 from g6.

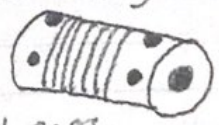
$D_{max} =$ **1 in**

$D_{min} = 1 - 0.0003$ in $=$ **0.9997 in**

Problem 5

Flexible Shaft Couplings

Product: High-misalignment precision Flexible Shaft Coupling



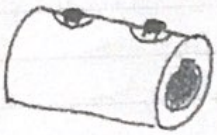
Part #: 5992 5K88

Cost: $ 94.68 each

Description: allows compensation in mis-aligned parts

Rigid Shaft Couplings

Product: Set Screw Shaft Coupling

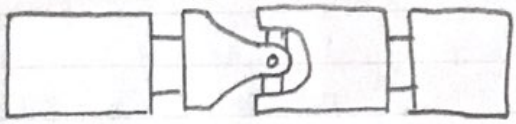


Part #: 6412K8

Cost: $ 16.05 each

Description: hold couplings in place with screws.

U-Joint



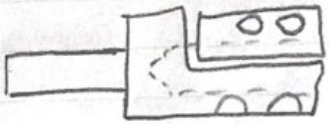
Product: Single - U - Joint
Part #: 8284K72
Cost: $151.15 each
Description: needle bearings allow high shaft speeds

Flexible Shafts

Product: Heavy Duty Flexible Shaft W/ Female & Female Fittings.
Part #: 6426K101
Cost: $179.28 each
Description: handles high torque applications

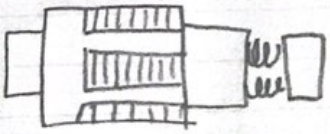
Shaft adapters

Product: Step-down Shaft adapter
Part #: 9783T11
Cost: $69.87 each
Description: reduces shaft diameter while still increasing length.



Torque-Limiting Shaft Couplings

Product: Torque-Limiting Couple
Part #: 9132K32
Cost: $128.25 each
Description: stops load when too much torque is applied.



Machinable Shaft Ends

Product: 7/8" Diameter keyed shafts,
Part #: 3463N91
Cost: $103.50 each
Description: allows you to clamp parts to shaft