Mechanical Eng. Dept.
ME 352

Taibah University
College of Engineering

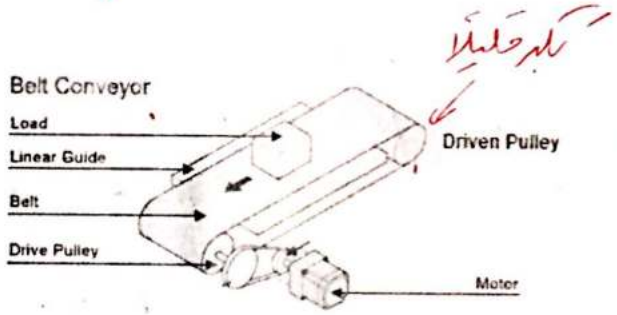
Mechanical Design II
March 2018
Quiz-2
Time allowed: 30 Min.

Student Name: ..... **I.D. #:**.....

The following figure shows a belt conveyor operated by an electric motor through an open type V-belt drive. Whereas, the belt conveyor is of type flat belt and operated between two equal diameters pulleys (drive and driven pulleys) of **500 mm** diameter. The belt carries a load of 500 kg weight and moves with linear speed of ~~15~~ 5 m/s. Coefficient of friction for belt with pulleys = **0.3**, Center distance between the two pulleys= **20m. Find the following:-**

a- The total length of the belt
b- The rotational speed of the pulleys.
c- The belt tensioning forces.
d- Power of the motor required to operate that belt conveyor.
e- The belt width, if its material allowable strength (S_{all})= ~~4~~ **MPa** and ~~10~~ **mm** thickness.

5



$\theta_1 = \theta_2 = \pi$

$L = \sqrt{4 \times (20)^2 - 0}$

(a) $+ \frac{1}{2} \times 0.5 [\pi + \pi]$

$= 2 \times 20 + \frac{1}{4} \times 2\pi = 41.57$ m

$$L = \sqrt{4C^2 - (D-d)^2} + \frac{1}{2}(D\theta_2 + d\theta_1)$$

$$\theta_1 = 180 - 2\sin^{-1}\left(\frac{D-d}{2C}\right)$$

$$\theta_2 = 180 + 2\sin^{-1}\left(\frac{D-d}{2C}\right)$$

$$(F_1 - F_2)\frac{d}{2} = T$$

$$\frac{F_1}{F_2} = e^{\mu\theta}$$

(b) $V = \omega R = \frac{2\pi n}{60} * 0.25 = 5$ m

$n = 191$ RPM

(c) $F_2 = \mu W = 0.3 \times 5000 = 1500$ N

$\frac{F_2}{F_1} = e^{\mu\theta} = e^{\pi * 0.3} = 2.548 \Rightarrow F_1 = 588.5$ N