2021A20 (ANGULAR VELOCITY, WIND SPEED)

Level 1: This problem can be solved by rearranging the rotational frequency equation as follows:

Time (seconds) = No. of Rotations / Rotational Frequency (rev/sec)

Time (seconds) = 250 / 30

Time taken to complete 250 rotations by the anemometer = 8.33 seconds

Level 2: Assuming the cup anemometer is well calibrated and is extremely accurate, it should entirely convert the linear velocity of the wind into the angular velocity of the cups. So, to find the wind speed, we need to start by figuring out the angular velocity of the cups. Angular velocity can be expressed as:

*Angular Velocity (rad/sec) = Rotational Frequency (rev/sec) * 2 * pi*

*Angular Velocity (rad/sec) = 20 * 2 * 3.14*

Angular Velocity (rad/sec) = 125.6 rad/sec

Now that we have the angular velocity, we can relate it to the wind speed by the equation shown below:

*Linear Velocity (m/s) = Angular Velocity (rad/sec) * Anemometer radius (cm) * 1/100 (m/cm)*

*Linear Velocity (m/s) = 125.6 * 30 * 1/100*

Linear Velocity (m/s) = 37.68 m/s

No, we would not be operating at this wind speed.

Here we see a meteorological pole being erected to gather wind data.