

Answers: Videotape Problem

- At what speed is the fan rotating? Explain.

Given a TV frame rate of 30 Hz and the fact that you see 3 markers appearing stationary, the fan is rotating at 10 Hz, one-third the sampling rate.

- Are there other rotational speeds that would give a video identical to what you have just seen (when the fan is rotating at its fastest speed)?

Yes, $(10 + 30n)$ Hz rotations would give the same video, frame by frame. Note that n could be a positive or negative integer. Note too that a 20 Hz rotation would appear to be the same *perceptually*, but not on a frame-by-frame basis.

- Why does the fan appear to be nearly stationary in the video?

Because there are 3 fan blades and the rotation rate is one-third the sampling rate. If there were 2 fan blades and the rotation rate was one-half the sampling rate, it would also appear stationary.