College of Engineering
School of Aerospace Engineering

AE 6705: Introduction to Mechatronics

LAB7

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Question 1

Solution:
The stepper motor fails to move at a predictable way at

$$\approx 100 \text{ Hz}$$

This is due to the fact that when the excitation rate is too quick the torque versus frequency relation of the motor enters the slew range defined for the motor where the motor skips some steps and would no longer be able to count the number of tracks taken. This is critical because the stepper motor controls its rotation/positioning by taking track of the number steps it has taken.

Question 2

Solution:
When two consecutive coils are energized simultaneously two phases are activated at once. This means that the torque increases by a factor of $\sqrt{2}$, and this is called the full stepping method of actuation.

Question 3

Solution:
Since the half stepping is a combination of the wave drive and full stepping actuation in which the former turns on only a single phase for an unipolar and two phases in the latter. This means when using the half stepping method the torque is going to fluctuate between a weaker and stronger state.