

### Lab 3 (Position control of Servo):

Pre-Lab: Read section 2.1 of the SRV02 Workbook and answer the questions in section 2.2 before coming to the lab. The nominal values of  $K$  and  $\tau$  from lab 1 are needed for question 4.

Lab Experiment:

1. Open the document “SRV02 Quick Setup guide” located in the “Getting Started” folder and follow the instructions to connect the SRV02, VoltPaq, and Q2\_USB data acquisition board.
  - a. Use the black RCA to RCA connector instead of the 2xRCA to 2xRCA cable.
2. In matlab, browse to the folder “C:\Users\Student\Documents\Matlab\SRV02\Controllers\02 - Position Control”
3. Read through Section 2.3.1.1 in the workbook, **SRV02 Workbook - QUARC (Student).pdf**
  - a. First configure the simulation using the instructions in section 2.4.2 of the workbook.
    - i. Basically the same as the previous lab, open the setup file, set the CONTROL\_TYPE to MANUAL and run the script.
  - b. When asked to enter calculated values for  $kp$  and  $kv$  in step 1 of the “Closed-loop Response with the PV Controller”, type in the MATLAB command window “ $kp = \dots$ ” and “ $kv = \dots$ ” without the quotes, where  $\dots$  represents your calculated value for each gain from the pre-lab.
4. Read through Section 2.3.1.2 in the workbook, **SRV02 Workbook - QUARC (Student).pdf**, to the run the PV control on the SRV02 hardware.
  - a. First configure the simulation using the instructions in section 2.4.3 of the workbook.
  - b. When asked to enter calculated values for  $kp$  and  $kv$  in step 2 of the “Experimental Setup”, type in the MATLAB command window “ $kp = \dots$ ” and “ $kv = \dots$ ” without the quotes, where  $\dots$  represents your calculated value for each gain from the pre-lab.
  - c. Students are advised to use the “Enc = 2”, encoder option (default) for sensing.
5. Read through section 2.3.2.1 to run the ramp response in simulation using PV control.
6. Read through section 2.3.2.2 to run the ramp response in experiment using PV control.

*Note: Ensure that the “QUARC Target for Windows x64 Configuration” is active, through the model explorer.*
7. Read through section 2.3.3 to implement a controller that will give zero steady-state error.

**Important:** Before closing the model, select “QUARC → Clean all ...” and click “Yes” on the prompt to delete all generated code.

Post-Lab: Write a lab report detailing the procedure and results of the experiments run. Guidelines for writing the lab report can be found in section 2.5 of the SRV02 Workbook.

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