

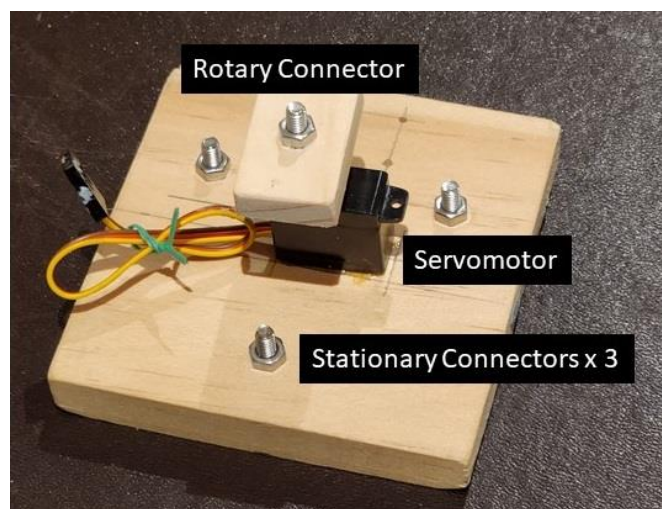
## Project Review Assignment A [8 marks]

### *Title:*

Swirling Mixer Mechanism

### *Brief:*

There is need for some reagents to be mixed without any elements coming in contact with the liquid. To do this, the liquid in a beaker is typically moved about in a way using a mechanism such that optimal mixing can be achieved. Essentially, as the beaker moves together with the displacing component of the mechanism, the liquid undergoes sloshing or swirling. This form of mixing may cause liquid to spill out from the beaker and should hence be prevented. The mechanism is expected to be anchored in place by attachment to the three stationary connectors on the servomotor assembly provided with the kit (see figure). The mechanism is alternatively driven to move via attachment to the rotary connector (which in turn is driven by the servomotor).



Servomotor Assembly

### *Specifications:*

#### Mechanism

- Material: No restriction.
- Dimensions: Not exceeding 100 mm x 100 mm x 100 mm (inclusive of the servomotor assembly)
- No secondary driver is allowed (mechanism is driven only by attachment to the rotary connector which is actuated by the servomotor)
- It does NOT have to be monolithic (single structure). It can consist of separate structures that are connected together. Any of the constituent structures can be flexible or rigid.
- The beaker (provided with the kit) should be able to be positioned repeatedly at the same location on the mechanism using kinematic mounting principles. No items (e.g. adhesive tape, sponge, etc.) should be attached to the beaker.

#### Servomotor actuation

- Interfacing: Using Arduino or any other microcontroller.
- Motion: Any programmed rotation of the servomotor that is limited to 15 seconds in duration.

#### Analysis

- Mobility analysis using the Kutzbach criterion is expected.
- The ability (or not) to attain kinematic constraint for the beaker is to be outlined.

*Demonstration:*

- Organize to show the mechanism to the coordinator BEFORE submission **OR within ONE week after submission. There is NO need to illustrate the motorized operation of the mechanism for this.**
- Just before the mechanism test, a drop of food dye will be added into the beaker.
- The beaker is to filled with 20 mL of water.
- Any tipping over or spillage from the beaker will be noted and penalties will apply.

*Submission (as a single .zip file):*

This is an individual submission. The deadline for submission is **Week 8 Friday 13/9/2024**. The submission MUST include:

**Video Recording**

- **Single .mp4 file**
- **Not exceeding 1 minute**
- **Emphasis to highlight important features of design and mixing effectiveness during operation**

**Documentation**

- Single .pdf file
- Not exceeding 1000 words
- Up to 10 figures are permitted
- Clear and concise explanation of the operation of the mechanism using grammatically correct sentences with no spelling errors

*Grading criteria:*

Awards:

	Poor (0-0.49)	Acceptable (0.5-0.69)	Good (0.6-0.79)	Excellent (0.8-1.0)
(a) Physical assembly installation (the mechanism can be installed and removed from the servomotor assembly with ease) [1%]				
(b) Physical assembly positioning (the beaker can be located repeatedly on the mechanism using kinematic mounting principles) [1%]				
(c) Physical assembly operation (the mechanism is able to generate motion with the beaker that facilitates mixing) [1%]				
(d) Physical assembly robustness (the mechanism is built as one unit and can be handled in any way with no operational changes after) [1%]				
(e) Physical assembly mixing (the mechanism is able to effectively achieve mixing in the liquid without any spillage) [1%]				
(f) Creativity (the physical assembly incorporates innovations that encourage simplification or the ready scaling up to support more demanding or complex schemes in the future) [1%]				
(g) Documentation effectiveness (the physical assembly are described, explained, and discussed in an organized, logical and succinct fashion) [2%]				

Penalties:

- (a) Failure to adhere closely to the specifications.
- (b) Grammatical and spelling errors in the documentation.
- (c) Poorly constructed and difficult to understand sentences in the documentation.
- (d) Hand drawn sketches and unclear images used as figures in the documentation.