Demonstration 1

**Frequency Response**

1. **Objective**
   To observe the frequency response of a dynamic system, i.e., the dependency of the magnitude and phase angle of the system output on the frequency of the sinusoidal input.

2. **Experimental Setting**
   The experimental setting for this demonstration is shown schematically in the following figure. It mainly consists of a Function Generator, a Dynamic System (or a Plant), a Potentiometer Sensor, and an Oscilloscope.

   ![Schematic Diagram](image)

   In particular,
   a) the Function Generator (FG601) is used to generate sinusoid signals for inputting the dynamics system,
   b) the Dynamic system consists of a Servo Amplifier (SA 150D) and a Servo Motor (MT 150F), which input is the sinusoid signal from the Function Generator and output is the angular position of the Servo Motor,
   c) the Potentiometer Sensor (OP 150K ) is used to measure the angular position of the Servo Motor, and
   d) the Oscilloscope is used to display the system input and output, i.e., the sinusoid signal generated by the Function Generator and the angular position measured by the Potentiometer Sensor.
3. **Observation**  
Varying the frequency of the system input, i.e., the frequency of the sinusoid signal, observe the variation of the magnitude and angle phase of the output, i.e., the angular position of the Servo Motor.

4. **Questions**
   a) How does the magnitude of angular position vary with the frequency of the sinusoid? Explain why.
   b) How does the angle phase of angular position vary with the frequency of the sinusoid? Explain why.
   c) Any other observations. Explain the possible reasons.