1. Show that the desired closed-loop transfer function: $H(z) = \dfrac{0.0409z + 0.0491}{z^2 - 1.4z + 0.49}$

   is a suitable choice for Ragazzini's method applied to a process with the open-loop transfer function: $G(z) = \dfrac{0.5z + 0.6}{z^2 - 1.2z + 0.27}$

   Consider: i) Stability, ii) Causality, iii) Steady state error (step input only), and iv) Sensitivity to modelling errors.

2. Determine H(z) and D(z) if the open-loop transfer function is:

$$G(z) = \frac{2}{z^2(z - 0.9)}$$

   and the desired closed-loop should be first order with a time constant of 1.4 s and no steady state error to a step input. The sampling period is 0.5 s.

3. Convert your D(z) from #2 to the discrete-time domain so it may be programmed on a microprocessor.

4. A plant's open-loop transfer function is:

$$G(z) = \frac{2}{(z - 0.8)(z - 0.4)}$$

   The closed-loop characteristic equation should be:

$$(z - 0.5)(z - 0.5) = 0$$

   and the closed-loop should have no steady state error to a step and a steady state error of 0.005 to a unit ramp. The sampling period is 0.01 s. Determine H(z).