There are 3 separate 8x80 loops as shown. The last quantity measured is \( W \), power out. This loop adjusts the strength of the generator field. By strengthening the field, more power is produced, but the field acts as a brake & slows the TRB/GEN set down. This is sensed & this second loop opens the valves into the turbine to admit more steam to bring the speed back up. Opening the valves makes the pressure in the steam drum drop. This is sensed in the third loop, and this causes the fuel flow to the boiler to increase.
Rewritten:
Simulink model is shown. With a constant 1 supplied and with \( K_p, K_i, K_o = 1 \), the proportional action will be a constant 1, the integrator is the area under the \( e \) curve. Each second this area increases by 1 unit. As can be seen, at \( t=1 \) sec, the integral of the error is 1. At 2 seconds, it’s 2, etc. So the \( I \)-action curve starts at 0 (no area under the \( e(t) \) curve yet) and ends at 10, at \( t=10 \). The \( D \)-action is always 0 because \( e \) is constant from 0 to 1. And the derivative of a constant is 0. Obviously, \( u(t) \) is the sum of the three actions.