We would like to implement a state variable feedback system with a full order observer to estimate the states and integral control to produce zero steady state error for a step input. The equations we would like to implement are:
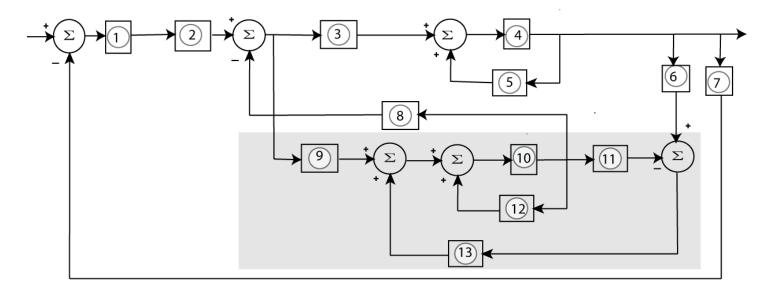
$$\dot{x}(t) = Ax(t) + Bu(t)$$
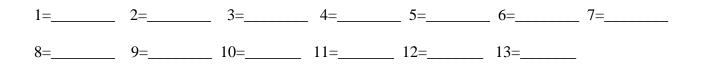$$u(t) = -K\tilde{x}(t) + K_I \xi(t)$$
$$\dot{\xi}(t) = r(t) - C_y x(t)$$
$$\dot{\tilde{x}}(t) = A\tilde{x}(t) + Bu(t) + K_e(Cx(t) - C\tilde{x}(t))$$

We will implement these equations using the following Simulink model

You need to indicate the content of each of the blocks in the figure above.

Your choices are: $A, B, C, C_y, D, K, K_e, K_I, \dfrac{1}{s}$ You may use each symbols as often as necessary.

1=_____ 2=_____ 3=_____ 4=_____ 5=_____ 6=_____ 7=_____

8=_____ 9=_____ 10=_____ 11=_____ 12=_____ 13=_____

Answers: $1 = \dfrac{1}{s}, 2 = K_I, 3 = B, 4 = \dfrac{1}{s}, 5 = A, 6 = C, 7 = C_y, 8 = K, 9 = B, 10 = \dfrac{1}{s}, 11 = C, 12 = A, 13 = K_e$