

Control + Automation Exam

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Question 2.



$$G = \frac{O_o}{E} \Rightarrow E = \frac{O_o}{G} \quad \text{and} \quad H = \frac{F}{O_o} \Rightarrow F = H O_o$$

$$E = O_i - F \quad (\text{Comparator})$$

Sub into comparator

$$O_o / G = O_i - H O_o$$

$$O_o = O_o / G + H O_o$$

Factorise for O_o

$$O_o = O_o \left(\frac{1 + G H}{G} \right)$$

$$\therefore \frac{O_o}{O_i} = \frac{G}{1 + G H} \quad \text{as required.}$$

$$\begin{aligned} \text{d) } \frac{O_o}{O_i} &= \frac{G}{1 + G H} = \frac{(5)(0.25)}{1 + (5)(0.25)(150 \times 10^{-3})} \quad \frac{\text{mA}}{\text{mA}} \quad \frac{\text{mV}}{\text{mA}} \\ &= 1.053 \quad \text{V/V} \end{aligned}$$

© • Automatic level of a cooling tank.

• Automatic conveyor motor speed adjustment allowing for load disturbances.