MECH3023: Building Energy Management and Control Systems

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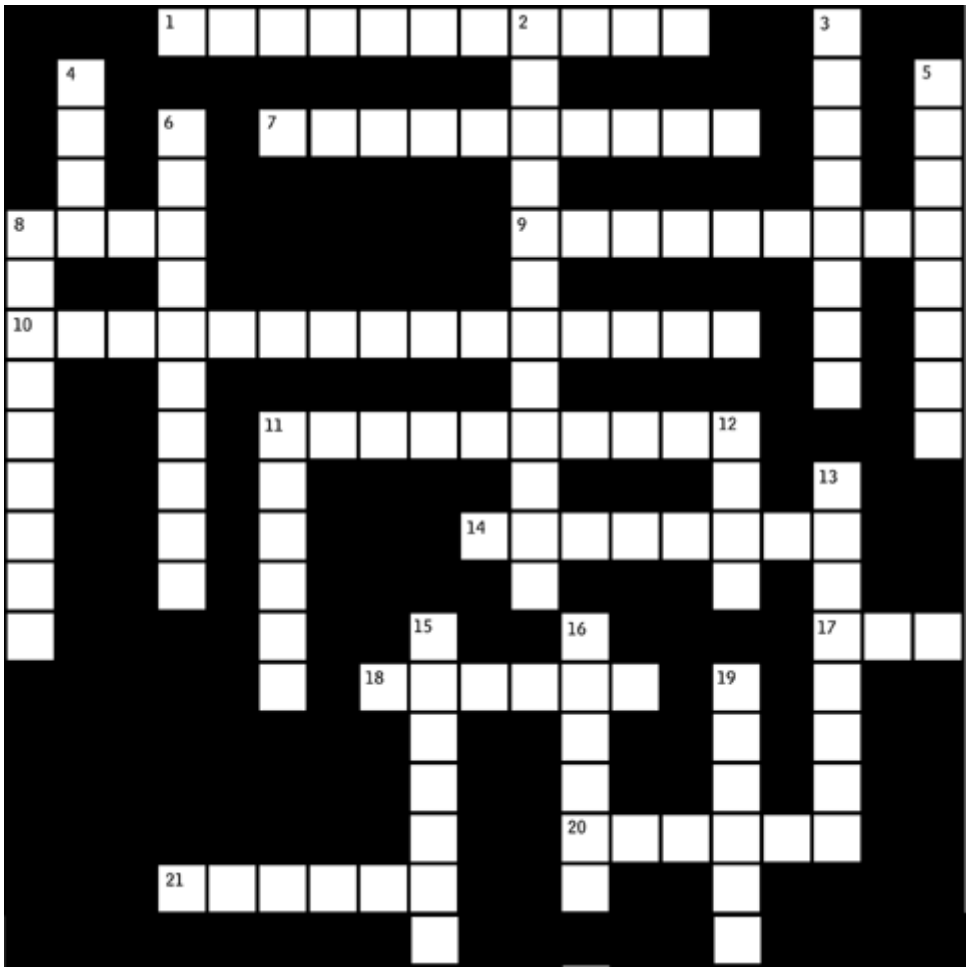
Crossword Puzzle: Fundamentals of Controls



ACROSS

1. Another term for humidity sensors which are used to measure relative humidity or dewpoint of ambient or moving air.

7. This component in a control system compares the value of the controlled variable with the setpoint and generates a signal to the controlled device for corrective action.

8. This type of control loop does not have a direct link between the value of the controlled variable and the controller.

9. These types of control components use compressed air as an energy source.

10. This type of curve shows the relationship of the percent stroke to the percent flow of a damper.

11. This range is the amount of change in the controlled variable required to cause the controller to move the controlled device from one extreme to the other.

14. This type of positioner provides up to full main control air pressure to the actuator for any change in position required by the controller.

17. This type of control adds a derivative term to the proportional and integral terms in the control equation.

18. Devices that regulate the flow of water or steam.

20. This "error" signal is fed into the controller, which sends a control signal to the controlled device.

21. Opening and flow are related in direct proportion with this type of control valve characteristic.

DOWN

2. This term is used for a control device that can only be positioned in a maximum or minimum state or on or off.

3. This is the time between a change in the process input and when the change affects the output of the process.

4. This type of controller is used to operate several switches in sequence by means of a proportional electric or pneumatic operator.

5. These types of control components use electrical energy as the energy source.

6. The device reacts to signals received from the controller to vary the flow of the control agent.

8. This type of sensor automatically adjusts controlled variables (e.g., lighting, ventilation rate, temperature) based on whether there is someone in the space.

11. When this is done systematically to a controller, it improves the performance of all controls and is particularly important for digital controls.

12. This is the amount the output of the component changes for a given change of input under steady-state conditions in a transfer function.

13. This is the desired value of the controlled variable.

15. Devices that regulate the flow of air.

16. This component in a control system measures the controlled variable and transmits values to the controller.

19. This type of control loop is also called "feedback control" and measures actual changes in the controlled variable and actuates the control device to bring about a change.

Useful reference: Chapter 15 ("Fundamentals of Controls") of the *2001 ASHRAE Fundamentals Handbook*.

(* Adapted from the journal *Engineered Systems*, August 2000)