



Answer all the following questions.

Clear all your answers with drawing.

Question (1)

(24 Marks)

- 1-1 What are the main components of automatic control system? Illustrate your answer with example of closed loop control system.
- 1-2 What are the types of control action in HVAC systems? Explain one of these.
- 1-3 Explain briefly the main components of air supply system for pneumatic control devices.
- 1-4 Explain briefly the energy sources for control systems?

Question (2)

(24 Marks)

- 2-1 Bridge circuits (Wheatstone bridge), Write notes on it (explain and sketch).
- 2-2 Electronic sensors for sensing temperature, mention one of them. (Explain and sketch).
- 2-3 Safety controls are used in HVAC systems, state all the types and explain one example.
- 2-4 Explain the idea of electromagnetic devices used in HVAC systems.

Question (3)

(30 Marks)

- 3-1 Explain with a sketch an example for control devices used in HVAC systems in case of preheating.
- 3-2 How you can make humidity control in HVAC systems, explain with a sketch one device.
- 3-3 Mention the humidity sensors and explain one of them?
- 3-4 Give an idea of controllers (float controller).
- 3-5 Solenoid expansion valve with interchangeable orifice is used in HVAC systems, sketch the construction and explain the operation of this device.
- 3-6 Thermostats are applications of control devices used in HVAC systems; state the most types, what are its functions. Give an example for its applications. ?

Question (4)

(22 Marks)

- 4-1 Explain clearly the bleed-type controller with sketch, (pneumatic control devices?)
- 4-2 Define actuator, state the idea and the operation of pneumatic actuators with the sketch
- 4-3 A certain thermometer has a time constant of 15 sec and an initial temperature of 20°C. It is suddenly exposed to a temperature of 100°C. Determine the rise time, that is, the time to attain 90 percent of the steady-state value, and the temperature at this time.
- 4-4 **Define:**
 - transducer with examples
 - Amplifiers

With the best wishes

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