



Answer all the following questions.

Clear all your answers with drawing.

Question (1) (26 Marks)

- 1-1 For pneumatic control devices sketch and explain the working of bleed-type controller.
- 1-2 Write notes about electric bridge circuits (Wheatstone bridge).
- 1-3 What is thermal expansion valve (TEV) used in refrigeration and air conditioning systems (sketch, theory of working, construction and its advantages)?
- 1-4 Explain briefly the energy sources for control systems?

Question (2) (24 Marks)

- 2-1 Why we use automatic control in the field of Heating Ventilating and Air Conditioning?
- 2-2 Explain electric control devices used in safety controls in HVAC.
- 2-3 Explain electromagnetic control devices (solenoid valve).
- 2-4 What are the main components of automatic control system? Illustrate your answer with example of closed or open loop control system.

Question (3) (26 Marks)

- 3-1 Illustrate the Two-Position On-Of control action showing the max. value, min. value, set point and lag time.
- 3-2 What are the types of sensors used in measuring temperature?. Explain one of them showing all its parts.
- 3-3 What are the types of *humidity sensors*?. And explain one of them with a suitable sketch?. What are the materials used in fabricating these sensors?
- 3-4 What are the types of *electric circuits* used in control systems used in refrigeration and air conditioning systems? And what are the main components of these circuits?

Question (4) (24 Marks)

- 4-1 What is function of thermostat? Give some examples of applications of using thermostat with sketches.
- 4-2 Mention all the flow rates measurement *sensors* (liquid and gas), select one of them and explain the construction with a sketch, theory of working and its advantages?
- 4-3 What are the types of *valves* used in control of refrigerant fluid flow rates.
- 4-4 Define:
 - transducer with examples
 - Amplifiers
 - Relays

With the best wishes

Dr. Ramadan A. El-danf, Prof. Dr. Shedid H.S, Dr. Ismael Saqer, Dr. Mohamed saed