

(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions out of the remaining **six** questions.
 (3) Illustrate answers with **sketches** wherever **required**.
 (4) Assumptions should be **clearly stated**.

1. Compare the following (any four) :- 20
 - (a) Single-seated and double-seated globe valves.
 - (b) Pneumatic and electric systems.
 - (c) 2-wire and 4-wire current transmitters.
 - (d) Safety valves and rupture disk.
 - (e) Control valve and flow regulator.
 - (f) On-delay timers and off-delay timers.
 - (g) Linear and rotary control valve actuators.

2. (a) Name the standard methods employed for pressure regulation in pneumatic systems. Explain any one method in detail. 10
- (b) Draw and explain the flapper-nozzle system. Explain how the non-linearity of flapper-nozzle can be overcome. 10

3. (a) Explain in detail the smart transmitters. 10
- (b) What are the different types of hydraulic pumps ? Explain the construction, working and applications of any one pump in detail. 10

4. (a) Define the following terms for process control valves :- 10
 - (i) Control valve capacity (C_v)
 - (ii) Rangeability (R)
 - (iii) Turndown (T)
 - (iv) Valve size (d) and
 - (v) Valve gain (K_v).
- (b) Explain the construction, operation, applications, advantages and disadvantages of following control valves with neat sketches :- 10
 - (i) Ball valves and
 - (ii) Butterfly valves.

5. (a) Draw and explain the inherent and installed flow characteristics of process control valves. Also state their applications. 10
- (b) Why is valve-positioner required ? When is it used ? Explain any one design of valve-positioners with neat sketch. 10

6. (a) What are the different types of alarm annunciators ? Draw and explain the elements of basic annunciator system. 10
- (b) Explain the construction, working and specifications of electro-mechanical relay with neat diagram. Also compare the interposing and overload relays. 10

7. (a) Develop the relay ladder and wiring diagrams for 5 H.P. motor control using following I/O hardware :- 10
 - (i) Start push-button (NO)
 - (ii) Stop push-button (NC)
 - (iii) Motor starter or control relay
 - (iv) Green light to indicate when motor turns ON, and
 - (v) Red light to indicate when motor turns OFF.
- (b) Draw and explain the construction of I/P converter. State where it is placed in process control loop. 10