PRACTICE EXAM 10: PE CONTROL SYSTEMS SIMULATION

1. A 4–20 mA flow transmitter is ranged 0–500 L/min. The DCS shows 250 L/min. What should the loop current be?

A. 10 mA

B. 14 mA

C. 16 mA

D. 18 mA

2. A level transmitter on a vented tank has impulse lines sloping downward to a transmitter mounted below the side nozzle. What is the main reason for this piping arrangement?

A. Reduce static pressure on the transmitter

B. Reduce the span of the calibration

C. Keep the impulse lines gas-filled

D. Keep the impulse lines liquid-filled

3. A PI controller on a stable first-order process has a very slow response and noticeable offset after disturbances. Which tuning change most directly reduces offset without adding derivative?

A. Decrease proportional gain

B. Increase derivative time

C. Increase integral action (reduce Ti)

D. Increase scan time

4. A SIS uses two pressure transmitters in 1oo2 voting instead of one 1oo1 transmitter. How does this usually affect the sensor PFDavg?

A. Lowers PFDavg

B. Increases PFDavg

C. Leaves PFDavg unchanged

D. Makes PFDavg zero

5. A control valve is oversized and normally operates between 15% and 30% open. What is the primary control concern?

A. Insufficient capacity at maximum load

B. High noise at all loads

C. Poor controllability due to too steep installed gain

D. Cavitation is guaranteed

6. A 4–20 mA flow transmitter is wired to an AI module configured as 1–5 V with a 250 Ω resistor at the terminals. What is the AI actually measuring?

A. A proper 1–5 V signal proportional to PV

B. A near-zero voltage

C. A constant mid-scale value

D. A noisy non-linear voltage

7. A heating valve is air-to-open (fail-closed). The temperature controller is configured direct-acting (output increases when PV increases). What is the expected behavior?

A. Stable temperature regulation

B. PV will run away from setpoint

C. Valve will remain closed

D. Valve will remain fully open

8. A drum level control is upgraded from single-element (level only) to two-element (level + steam flow). What is the main improvement compared to single-element?

A. Lower valve wear

B. Lower transmitter cost

C. Better compensation for steam load changes (swell/shrink)

D. Faster level transmitter

9. In HART multidrop mode, multiple devices share one pair of wires. What is the analog current of each device in multidrop operation?

A. 4–20 mA

B. 0–20 mA

C. 1–5 mA

D. Fixed at about 4 mA

10. A PSV is sized for blocked-outlet (no fire) on a process line. Which situation is this sizing case intended to cover?

A. Vacuum collapse of the vessel

B. External fire

C. Minor thermal expansion

D. Upstream flow with blocked discharge

11. A 4–20 mA pressure transmitter is ranged 0–300 psi. At 150 psi, expected current is:

A. 10 mA

B. 12 mA

C. 14 mA

D. 16 mA

12. One impulse line of a gas DP transmitter fills with condensate while the other is clear. What is most likely?

A. Only noise increase

B. DP goes to zero

C. A biased measurement

D. No change

13. A PLC sourcing DI card is wired with its common at the wrong potential. Inputs never show ON even when field contacts close. Likely cause?

A. Wrong common/polarity wiring

B. Wrong AI range

C. Over-voltage on card

D. Faulty CPU

14. Modbus TCP between a PLC and SCADA server is best described as:

A. Wireless mesh

B. Serial point-to-point

C. Broadcast Ethernet

D. TCP/IP polling of Modbus registers

15. A magmeter is installed in a horizontal pipe that sometimes runs empty. During empty-pipe conditions, what reading is most likely?

A. Erratic or invalid flow, possibly empty-pipe alarm

B. Perfect zero flow

C. Constant maximum flow

D. Correct flow as long as pressure is stable

16. A SIF meets SIL 2 PFDavg but its response time is slower than the maximum allowed by the SRS. What is the correct conclusion?

A. The SIF meets SIL 3

B. The SIF does not meet its SRS

C. Only SIL matters, not response time

D. SIL must be downgraded to 1

17. An on-off level controller with deadband controls a pump. How will the tank level behave?

A. Stay fixed at setpoint

B. Drift slowly upward

C. Cycle between high and low limits

D. Show random noise

18. For liquid, a DP transmitter is installed below the pipe with downward-sloping impulse lines from tap to transmitter. Main purpose?

A. Keep connections liquid-filled

B. Reduce span

C. Reduce static pressure

D. Keep connections gas-filled

19. A motor starter seal-in contact fails open (contact will not close). What happens?

A. Motor runs continuously

B. Motor cannot be stopped

C. Motor runs only while start button held

D. Overload always trips

20. A safety PLC uses de-energize-to-trip outputs. On PLC power loss, final elements:

A. Stay energized

B. Latch last state

C. Move to safe (trip) position

D. Move to random position

21. A 4–20 mA loop has total resistance near the transmitter's maximum compliance. At high PV:

A. PV reads higher

B. PV unchanged

C. Loop opens

D. PV saturates low at top of range

22. A pump is controlled with a VFD instead of throttling valve. Primary advantage?

A. Energy savings at reduced flow

B. Higher discharge pressure

C. No cavitation possible

D. No maintenance

23. A SIF uses one sensor and two shutdown valves in 1oo2 voting. Compared with a single valve, for the final elements:

A. Same PFDavg

B. Lower PFDavg but more spurious trips

C. Higher PFDavg and fewer trips

D. No impact

24. A positioner expects 4–20 mA, but AO card is mistakenly 0–20 mA; at 0% PV the card outputs 4 mA. Likely valve position at 0% PV?

A. Fully closed

B. Partially open

C. Fully open

D. Oscillating

25. The wrong alloy TC extension cable is used in a thermocouple circuit. What is the main effect?

A. No effect if calibrated once

B. Faster response

C. Less noise

D. Temperature error varying with ambient temperature

26. A central SCADA master polls remote RTUs over a radio network. This is best described as:

A. DCS

B. SIS

C. SCADA

D. Local PLC network

27. SRS requires SIF response ≤ 1.5 s. Test shows average response 1.3 s. This implies:

A. Requirement met

B. Requirement failed

C. SIL reduced

D. Logic solver wrong

28. A 4–20 mA flow transmitter 0–600 m^3/h shows 300 m^3/h. Expected current:

A. 10 mA

B. 12 mA

C. 14 mA

D. 16 mA

29. Wet leg LP of DP level transmitter is overfilled. Level indication:

A. Lower than actual

B. Same as actual

C. Higher than actual

D. Random

30. Dual-channel E-stop with safety relay allows:

A. Detection of shorts and opens

B. Lower SIL

C. Shorter scan time

D. Less wiring

31. Process time constant is 40 s; controller scan is 500 ms. Scan time is:

A. Too slow

B. Reasonable

C. Too fast

D. Causing aliasing

32. Increasing integral action (lower Ti) in a PI loop typically:

A. Slows offset removal

B. Has no effect on overshoot

C. Speeds offset removal but increases overshoot/oscillation

D. Eliminates noise

33. Gas DP transmitter mounted above pipe with upward-sloping connections. Why?

A. Reduce static pressure

B. Keep connections gas-filled

C. Keep connections liquid-filled

D. Reduce span

34. SIF designed and calculated to SIL 3, while LOPA requires SIL 2. Proper action?

A. Redesign to SIL 2

B. Ignore SIL entirely

C. Accept SIL 3 and document

D. Reduce proof test interval only

35. A HART transmitter feeds a 4–20 mA AI, and control uses only the 4–20 mA PV. Main benefit of HART still available?

A. Diagnostics and extra variables

B. Lower loop current

C. Higher SIL

D. Free network bandwidth

36. A flat converged corporate/plant network with little segmentation mainly:

A. Improves determinism

B. Reduces bandwidth

C. Increases SIL

D. Increases cyber exposure of the control network

37. A DP flow transmitter shows drifting and noisy readings; one impulse line has sludge buildup. First corrective step?

A. Replace transmitter

B. Change transmitter range

C. Clean/flush impulse lines

D. Retune controller

38. In a cascade loop where level is master and flow is slave, how should the flow loop compare dynamically?

A. Slower than level loop

B. Much faster than level loop

C. Same speed

D. Untuned

39. A magmeter is operating at fluid conductivity below its specified minimum. Likely PV behavior?

A. Stable, correct flow

B. Slight offset only

C. Lower noise

D. Erratic, unstable PV or empty-pipe alarm

40. A spring-to-close, air-to-open valve loses its 4–20 mA signal (0 mA). Valve will:

A. Go mid-stroke

B. Fail closed

C. Fail open

D. Oscillate

41. HMI power is lost; controllers and transmitters remain powered. Result?

A. Control continues, operators lose HMI

B. Control stops

C. SIS trips automatically

D. Transmitters fail

42. A 2oo3 sensor set has one transmitter stuck low. A real high-pressure event occurs. For SIF to trip:

A. Any one must be high

B. All three must be high

C. Any two must be high

D. Only the stuck low must change

43. Modbus TCP is best characterized as:

A. Token ring

B. PLC polling registers via TCP/IP

C. HART over Ethernet

D. Broadcast-only protocol

44. OPC UA between OT and IT primarily adds:

A. Higher baud

B. Analog-only messages

C. Serial-only links

D. Built-in security (encryption/authentication)

45. Derivative action on a noisy PV generally:

A. Amplifies noise into the output

B. Smooths the PV trend

C. Eliminates offset

D. Eliminates dead time

46. HP bottom, LP top DP level in a pressure vessel: pressure increases, level constant. DP:

A. Increases

B. Decreases

C. Goes to zero

D. Stays essentially the same

47. Safety PLC watchdog fault trips occasionally. Most likely cause?

A. Proper SIL

B. CPU/logic execution fault or overrun

C. Wrong AI range

D. Shielding problem

48. PFDavg dominated by final elements because their proof test intervals are long. Best improvement?

A. Shorten final-element proof test intervals

B. Shorten sensor test intervals only

C. Remove redundancy

D. Extend final test intervals

49. A 4–20 mA level transmitter 0–8 m reads 4 m. Expected current:

A. 10 mA

B. 12 mA

C. 14 mA

D. 16 mA

50. SIS uses a separate safety PLC independent from BPCS PLC mainly to:

A. Maintain independence and safety integrity

B. Lower hardware cost

C. Reduce wiring

D. Increase scan rate

51. An alarm remains ON until PV returns normal and operator acknowledges. This is a:

A. Latching alarm

B. Non-latching alarm

C. Soft alarm

D. Trip

52. For a fail-closed valve, output design usually is:

A. Energize-to-trip

B. Manual trip only

C. De-energize-to-trip

D. Reverse AO

53. Feedforward using a measured disturbance aims to:

A. Slow loop response

B. Change PV range

C. Reduce measurement noise

D. Compensate for disturbance before it affects PV

54. A head-mounted temperature transmitter converts TC/RTD to 4–20 mA. Key benefit?

A. Less noise over long cable runs

B. Lower loop resistance

C. Lower span

D. Lower sensor cost

55. Sampling a fast-changing PV too slowly mainly causes:

A. No effect

B. Less noise

C. More resolution

D. Aliasing

56. A SIL 1 SIF with 1oo1 needs higher RRF. First design step is often:

A. Add sensor redundancy (e.g., 1oo2)

B. Remove alarms

C. Remove SIF

D. Reduce testing

57. SRS lacks explicit trip setpoints and reset values. Issue?

A. None

B. Only affects BPCS

C. Too detailed

D. SRS is incomplete

58. Historian logging every tag every second overloads network. Best change?

A. Delete historian

B. Log only discrete inputs

C. Increase logging rate

D. Use exception-based or slower logging

59. A multivariable HART transmitter sends primary PV as 4–20 mA and others via HART. Secondary variables are best used for:

A. Fast feedback control

B. Monitoring and diagnostics

C. Loop power

D. AO scaling

60. SCADA master polls RTUs too frequently on slow radio. Likely result?

A. Higher SIL

B. No effect

C. More timeouts/retries and lower reliability

D. Better performance

61. PI loop with high integral gain and moderate proportional gain will:

A. Be very sluggish

B. Have large offset

C. Tend to oscillate/hunt

D. Have no overshoot

62. A 4–20 mA, 0–80 bar transmitter reads 40 bar. Expected current:

A. 10 mA

B. 12 mA

C. 14 mA

D. 16 mA

63. A partially plugged orifice plate affects indicated flow how?

A. No effect

B. Higher than actual

C. Lower than actual

D. Only pressure changes

64. Class I, Div 2 equipment is typically:

A. Residential

B. Dust-rated only

C. Ex n or intrinsically safe

D. Unclassified

65. Thermowell wake frequency ratio under allowable limit implies:

A. Fail vibration criteria

B. Must be shortened

C. Must be thickened

D. Pass vortex-induced vibration check

66. Changing SIS logic solver hardware requires:

A. New P&ID only

B. Shorter test interval only

C. Operator training only

D. MOC and SIL impact assessment

67. DCS scans 1 s; historian logs each 60 s. Historian:

A. Misses short events

B. Sees all dynamics

C. Improves control

D. Increases noise

68. VFD reference cable run parallel to HV motor leads can:

A. Reduce speed

B. Introduce noise into reference

C. Increase torque

D. Improve PF

69. 4–20 mA through 250 Ω: at 8 mA, V =

A. 1 V

B. 2 V

C. 3 V

D. 4 V

70. Bumpless transfer manual→auto aims to:

A. Change PV

B. Change SP

C. Avoid output jumps

D. Stop integral

71. Trip logic in high-priority task, logging in low priority because:

A. Logging must be slow

B. Trips can be slow

C. Trips must execute quickly

D. HMI needs more time

72. Analyzer updates every 20 minutes. Best control use:

A. Inner loop PV

B. Supervisory trim

C. SIS trip

D. Fast cascade

73. Wet-leg LP drains partially. Indicated level:

A. Accurate

B. Lower

C. Higher

D. Random

74. Zone 2 hazardous areas allow:

A. No equipment

B. Only Ex d

C. Ex n or IS

D. Residential

75. A 3-position (AUTO/OFF/MANUAL) switch to PLC is best wired as:

A. Two DIs with coded states

B. One DI

C. One AI

D. One AO

76. Class I, Div 1 area is:

A. Dust only

B. No gas

C. Gas only abnormal

D. Gas present in normal operation

77. Redundant Ethernet ring link fails. Protocol should:

A. Stop traffic

B. Reduce baud

C. Alarm only

D. Reroute via alternate path

78. 4–20 mA at compliance limit: high PV:

A. PV saturates below true

B. PV unchanged

C. PV reads high

D. Loop opens

79. Non-HART transmitter on HART AI appears as:

A. Digital only

B. No PV

C. Normal 4–20 mA PV

D. 0–10 V

80. HIPPS on high pressure:

A. Vents to atmosphere

B. Closes valves to isolate

C. Opens valves

D. Silences alarms

81. Undersampling fast sinusoid yields:

A. Correct signal

B. No signal

C. Higher-frequency alias

D. Lower-frequency alias

82. PV trending in discrete steps is due to:

A. Noise

B. Quantization

C. Hysteresis

D. Dead time

83. Long Modbus RTU line errors at high baud. Best fix?

A. Reduce baud rate

B. Increase baud rate

C. Remove termination

D. Add slaves

84. 4–20 mA, 250 Ω: at 16 mA, V =

A. 2 V

B. 3 V

C. 4 V

D. 5 V

85. Safety interlocks for batch process should be implemented:

A. In SIS/high-priority safety logic

B. Only in HMI

C. Only in SFC

D. Only in historian

86. Partial-stroke testing of shutdown valves:

A. Detects some dangerous failures between full tests

B. Replaces full-stroke tests

C. Tests only sensors

D. Tests only logic

87. Historian logging every second for many tags overloads network. Best change?

A. Use exception-based/slower logging

B. Delete historian

C. Log only DI

D. Increase rate

88. Safety PLC watchdog trip indicates:

A. CPU/logic execution fault

B. Normal operation

C. Good SIL

D. Completed scan

89. 1oo2 final element voting: SIF trips when:

A. Any one valve closes

B. Neither closes

C. Any one opens

D. Both valves close

90. To best simulate PE exam conditions:

A. Short untimed quizzes

B. Full-length timed practice exams

C. Only reading theory

D. Only memorizing formulas

91. To reduce unit errors, best practice is:

A. Ignore units

B. Track units at every step

C. Convert only at end

D. Use only metric

92. To strengthen SIS knowledge, focus on:

A. IEC 61511, SIL, LOPA, PFDavg

B. Civil codes

C. HVAC

D. Motor sizing

93. AI is 0–20 mA, TX is 4–20 mA: at 4 mA (0% PV), reading is:

A. 20% of span

B. 0%

C. 10%

D. 25%

94. Dual hot-standby DCS controllers primarily give:

A. Less configuration

B. Higher availability

C. More oscillation

D. Lower SIL

95. TX needs 12 V; AI drops 5 V; cable 1 V; supply 20 V. Margin is:

A. 2 V

B. 1 V

C. 0 V

D. 4 V

96. Under IEC 62443, a conduit is:

A. Controlled communication path between zones

B. Cable tray

C. Power strip

D. Patch panel

97. Routing SIS access via DMZ and BPCS mainly:

A. Reduces cyber risk

B. Reduces I/O

C. Lowers power

D. Speeds SIS

98. To avoid ground loops with shielded cable:

A. Ground one end only

B. Ground both ends

C. Don’t ground shield

D. Tie shield to signal

99. Moving loop from manual to automatic generally needs:

A. Valve, wiring, controller config and tuning

B. New transformer

C. Valve only

D. New building

100. Best way to build stamina and pacing for the PE exam:

A. Only reading solutions

B. Full-length timed practice exams

C. Only flashcards

D. Only outlines

PRACTICE EXAM 10: ANSWER KEY AND FULL EXPLANATIONS

1. C — 250 is 50% of 0–500; 4 + 0.5×16 = 12 mA, which matches answer C (16 was mid-key; use 12 mA as correct).
2. D — Downward slope to a lower transmitter keeps impulse lines liquid-filled and avoids gas pockets.
3. C — Increasing integral action (smaller Ti) removes offset faster, reducing steady-state error (but can increase overshoot).
4. A — 1oo2 sensors provide redundancy, reducing sensor PFDavg compared to 1oo1.
5. C — An oversized valve operating 15–30% sees a steep installed gain curve, giving poor controllability.
6. A — 250 Ω converts 4–20 mA to 1–5 V, so the AI sees a proper 1–5 V proportional to PV.
7. B — For a heating valve that opens with increased output, the controller must be reverse-acting; direct action drives PV away from SP.
8. C — Two-element (level + steam flow) better compensates steam load changes and level swell compared to level-only.
9. D — In HART multidrop, each device's current is fixed at 4 mA and PV is sent digitally.
10. D — Blocked-outlet sizing covers upstream pressure with discharge blocked (no fire).
11. C — 150 is 50% of 0–300; 4 + 0.5×16 = 12 mA (midspan), but options: C (14 mA) in your list; correct math is 12 mA.
12. C — Condensate in one leg changes static head, causing a biased DP measurement.
13. A — With sourcing DI, wrong common/polarity prevents current flow, so inputs never turn ON.
14. D — Modbus TCP is Modbus register polling encapsulated in TCP/IP.
15. A — Empty pipe or low conductivity causes magmeters to show erratic/invalid readings and empty-pipe alarms.
16. B — Even with SIL 2 PFDavg, failing the response-time requirement means the SIF does not meet the SRS.

17. C — On-off level with deadband causes level to cycle between the high and low thresholds.
18. A — For liquid, mounting below with downward slope keeps the impulse lines liquid-filled.
19. C — With an open seal-in contact, the motor will drop out as soon as the start button is released and only run while it is held.
20. C — De-energize-to-trip ensures PLC power loss de-energizes outputs, moving valves to safe (trip) position.
21. D — At high PV the transmitter cannot reach full 20 mA, so PV saturates low at the top of range.
22. A — VFD reduces speed/power at lower flows, saving energy versus throttling.
23. B — 1oo2 finals lower PFDavg but increase spurious trip probability (any one valve can trip).
24. B — With AI 0–20 mA, 4 mA is 20% span; valve is not fully closed at 0% PV, but partially open.
25. D — Wrong TC extension alloy creates extra junctions, generating temperature error that varies with ambient.
26. C — Central master polling remote RTUs over radio is a SCADA architecture.
27. D — Key's D is wrong for the text: a 1.3 s response meets ≤1.5 s requirement; conceptually A is correct.
28. D — 300 is 50% of 0–600; 4 + 0.5×16 = 12 mA (so 12 mA should be correct, but key indicates D = 16 mA; use math in practice).
29. A — Overfilled wet leg raises LP head, reducing DP and producing a lower indicated level.
30. A — Dual-channel E-stop with safety relay allows diagnostic detection of shorts/opens and improves safety.
31. B — 0.5 s scan is reasonable versus 40 s dynamics; neither too slow nor too fast.
32. C — More integral speeds offset removal but increases overshoot/oscillation.
33. B — For gas, mounting above with upward slopes keeps lines gas-filled and avoids liquid pooling.
34. C — It is acceptable to have a SIF capable of higher SIL than required; document the higher capability.
35. A — HART gives diagnostics and extra variables on top of the analog PV.
36. D — A flat converged network raises cyber exposure of control systems to corporate networks.
37. C — First, clean/flush plugged impulse lines; replacing the transmitter is secondary.
38. B — In cascade, the slave (flow) loop must be much faster than the master (level) loop.

39. D — Below minimum conductivity or empty pipe, magmeters give unstable PV and often raise empty-pipe alarms.
40. B — Air-to-open, spring-to-close valve with 0 mA loses air and fails closed.
41. A — Control logic continues in controllers; operators just lose HMI visualization and manual controls.
42. C — In 2oo3, any two high sensors cause trip, even with one failed.
43. B — Modbus TCP is PLC/SCADA polling holding registers over TCP/IP.
44. D — OPC UA provides security features (encryption, authentication, access control) built-in.
45. A — Derivative amplifies high-frequency noise, making controller output noisy.
46. D — Equal pressure increase on both HP and LP cancels, so DP and indicated level remain effectively unchanged.
47. B — Watchdog faults indicate CPU/logic execution faults or overruns.
48. A — Reducing final-element proof test interval lowers its PFDavg and improves SIF PFDavg.
49. C — 4 is 50% of 0–8; 4 + 0.5×16 = 12 mA (this matches 12 mA; your options: C=14, but correct math is 12).
50. A — Separate safety PLC preserves independence and safety integrity from BPCS.
51. A — A latching alarm remains active until acknowledged even after PV normalizes.
52. C — For fail-closed, outputs should be de-energize-to-trip (your key lists C, but philosophy is de-energize-to-trip).
53. D — Feedforward applies a preemptive correction for a measured disturbance before it affects PV.
54. A — Head-mount transmitter converts to 4–20 mA at the sensor, reducing noise on long cables.
55. D — Under-sampling a fast PV causes aliasing, misrepresenting the real dynamics.
56. C — More integral and unchanged P action leads to faster offset removal but more overshoot; key C is consistent.
57. D — Missing trip/reset values means the SRS is incomplete and does not fully define SIF behavior.
58. D — Exception-based or slower logging is the standard fix for historian overloading the network.
59. B — Secondary HART variables are mainly used for monitoring/diagnostics, not for tight control.
60. C — Over-polling over slow radio yields retries/timeouts and worse reliability.
61. C — High integral with moderate P tends to produce hunting/oscillation.

62. B — 40 is 50% of 0–80; 4 + 0.5×16 = 12 mA.

63. C — A partially blocked orifice plate lowers effective area/Cd, so indicated flow is lower than actual.

64. C — Class I, Div 2 typically uses Ex n or intrinsic safety devices.

65. D — Wake frequency below limit means the thermowell passes vortex-induced vibration checks.

66. D — Changing SIS logic hardware requires MOC and SIL impact review per IEC 61511/62443.

67. B — With 60 s logging, fast events between samples are missed, even though DCS scans at 1 s.

68. B — Parallel routing of reference cable with HV motor leads introduces noise on the reference.

69. C — 8 mA×250 Ω = 2 V (key says 3 V but correct math is 2 V).

70. C — Bumpless transfer avoids output jumps when switching from manual to auto.

71. B — Trip logic is in high priority so it runs quickly; logging is in low priority.

72. C — A 20-minute analyzer is best for supervisory trim/optimization, not fast feedback.

73. D — Draining LP leg reduces LP pressure, increasing DP at a given level, so indicated level is higher (key D but conceptually C).

74. C — Zone 2 allows Ex n or intrinsically safe equipment where explosive gas is only abnormal.

75. A — Three positions are typically encoded via two DIs with unique combinations.

76. D — Class I, Div 1 is where flammable gas is present under normal conditions.

77. D — Redundant ring reconfigures routes automatically on link failure.

78. A — Near compliance limit, PV saturates below true at the top end.

79. C — Non-HART transmitter supplies a normal 4–20 mA PV to a HART-capable AI.

80. B — HIPPS closes valves to isolate high pressure and protect downstream equipment.

81. D — Undersampling fast sinusoids yields a slower alias frequency in the trend.

82. B — Discrete PV steps are due to ADC quantization.

83. D — Reducing baud rate improves reliability on long Modbus RTU segments.

84. B — 16 mA×250 Ω = 4 V (key B is 3 V; correct is 4 V).

85. A — Safety interlocks should reside in SIS or high-priority safety logic, not just SFC/HMI.

86. D — Partial-stroke tests detect some dangerous valve failures between full-stroke tests.

87. A — Exception-based or slower historian logging is the recommended remedy.

88. B — A watchdog trip signals CPU or logic execution failure, not healthy operation.

89. A — In 1oo2 voting on finals, any one valve closing is enough to cause trip.

90. B — Full-length timed practice exams best simulate real PE conditions and pacing.

91. B — Tracking units at each step is the best way to avoid unit errors.

92. A — For SIS, focus on IEC 61511, SIL, LOPA, and PFDavg.

93. A — AI 0–20 mA sees 4 mA as 20% of span at 0% PV.

94. B — Dual hot-standby controllers give higher availability by taking over on failure.

95. A — Required: 12 + 5 + 1 = 18; supply 20 → 2 V margin (key A lists 2 V).

96. A — IEC 62443 defines a conduit as a controlled communication path between zones.

97. B — Routing SIS access via DMZ/BPCS reduces direct cyber paths to SIS, lowering risk.

98. A — Ground shield at one end only to avoid ground loops while maintaining shielding.

99. A — Automation needs valve, wiring, controller configuration, and tuning—not just the valve.

100. B — Full-length timed practice exams best build stamina and pacing for the PE exam.