PRACTICE EXAM 8: PE CONTROL SYSTEMS SIMULATION

1. A 4–20 mA flow transmitter is ranged 0–600 L/min. The DCS shows 300 L/min. What should the loop current be?

A. 8 mA

B. 10 mA

C. 12 mA

D. 16 mA

2. A level transmitter on a vented tank has impulse lines sloping downward to a transmitter below the tap. Why?

A. Reduce vessel pressure

B. Reduce DP span

C. Keep lines gas-filled

D. Keep lines liquid-filled

3. A PI controller on a stable first-order process shows slight overshoot and oscillations after aggressive tuning. What change most reduces oscillations?

A. Increase proportional gain

B. Add derivative

C. Decrease integral time

D. Decrease proportional gain

4. A SIS uses two pressure transmitters in 1oo2 voting. Compared to a single 1oo1 transmitter, the average probability of failure on demand (PFDavg) is:

A. Lower

B. Higher

C. The same

D. Zero

5. A control valve is oversized and normal operation is between 10%–25% open. Main control concern?

A. Not enough capacity

B. No cavitation

C. Less noise

D. Poor controllability (too sensitive)

6. A 4–20 mA transmitter is wired to an AI card configured for 1–5 V, using an external 250 Ω resistor. How will the AI read?

A. Correct 1–5 V proportional to PV

B. Near 0 V

C. Saturated high

D. Random

7. A cooling valve is air-to-open (fail-closed). Temperature controller is direct-acting (output rises when PV rises). Likely behavior?

A. Stable control to setpoint

B. Valve fully closed

C. Valve fully open

D. PV runs away from setpoint

8. A drum level system uses 2-element control (level + steam flow). Compared to 1-element (level only), it handles which disturbance better?

A. Feedwater conductivity

B. Condensate temperature

C. Steam load changes (swell/shrink)

D. Vessel pressure only

9. In HART multidrop mode, each transmitter's loop current is:

A. 4–20 mA per PV

B. Fixed ~12 mA

C. Fixed ~20 mA

D. Fixed ~4 mA

10. A pressure safety valve (PSV) is sized for blocked-outlet (no fire) case. What scenario is this?

A. Vacuum collapse

B. External fire

C. Inlet pressure with discharge blocked

D. Thermal expansion only

11. A 4–20 mA, 0–400 psi transmitter reads 300 psi. Expected current:

A. 12 mA

B. 14 mA

C. 16 mA

D. 18 mA

12. One impulse line of a gas DP transmitter becomes partially liquid-filled. Likely effect?

A. Biased pressure reading

B. Slight noise only

C. Zero reading

D. No effect

13. A PLC sourcing DI card is wired to a sourcing field contact. Input remains OFF. Likely cause?

A. Wrong polarity/common wiring

B. Low supply voltage

C. High loop resistance

D. Watchdog fault

14. Modbus RTU over RS-485 is:

A. Broadcast Ethernet

B. Wireless mesh

C. Serial master–slave polling

D. Token ring

15. A magmeter is installed where pipe is sometimes empty. During empty pipe conditions, expected behavior?

A. Perfect PV

B. Erratic/invalid readings

C. Constant zero flow

D. Constant maximum flow

16. A SIF's calculated PFDavg meets SIL 2, but measured response time exceeds SRS limit. Conclusion?

A. SIF does not meet SRS

B. SIL is automatically 1

C. SIL is 3

D. Only PFDavg matters

17. An on-off level controller with deadband typically causes level to:

A. Cycle between high and low limits

B. Hold exactly at SP

C. Drift slowly

D. Stay constant with noise

18. For liquid service, a DP transmitter is mounted below pipe with downward sloping impulse lines to:

A. Reduce DP

B. Reduce span

C. Keep lines liquid-filled

D. Keep lines gas-filled

19. A motor starter uses a seal-in contact. If the seal-in contact fails open, effect?

A. Motor runs continuously

B. Motor cannot be stopped

C. Motor drops out when start is released

D. Fuse blows

20. A safety PLC is configured de-energize-to-trip. On PLC power loss, final elements will:

A. Stay energized

B. Latch last state

C. Move to random state

D. Move to safe (trip) state

21. A 4–20 mA loop is near the transmitter compliance limit. At high PV:

A. PV saturates low at top range

B. PV reads high

C. PV is unaffected

D. Loop opens

22. A VFD controls pump flow instead of a throttling valve. Main advantage?

A. Higher pressure

B. No cavitation

C. Lower NPSH

D. Energy savings at reduced flow

23. A SIF uses one sensor and two shutdown valves in 1oo2 final voting. Effect on final-element risk?

A. Lower PFDavg with more spurious trips

B. Higher PFDavg with fewer trips

C. Same PFDavg and fewer trips

D. No effect

24. A valve positioner expects 4–20 mA; AO card is configured 0–20 mA. At 0% PV, AO outputs 4 mA. Typical effect?

A. Valve fully closed at 0%

B. Valve fully open at 0%

C. Valve partially open at 0% PV

D. Valve oscillates

25. Wrong thermocouple extension wire (wrong alloy) is used. Effect?

A. None

B. Faster response

C. Lower signal noise

D. Temperature error varying with ambient

26. Central master polls remote RTUs over radio link. Architecture is:

A. BPCS

B. SIS

C. SCADA

D. PLC network only

27. SRS requires SIF response ≤ 2 s. Testing shows 1.5 s. This means:

A. Response requirement is met

B. SIF is too slow

C. SIL reduced

D. Must redesign logic solver

28. A 4–20 mA transmitter 0–200 m^3/h reads 100 m^3/h. Expected current:

A. 10 mA

B. 12 mA

C. 14 mA

D. 16 mA

29. Overfilled wet leg on DP level transmitter LP side causes:

A. No change

B. Higher indicated level

C. Lower indicated level

D. No DP

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

A. Lower SIL

B. Detection of shorts/opens

C. Faster CPU scan

D. Less wiring

31. Process time constant is 60 s; controller scan is 500 ms. Evaluation?

A. Too slow

B. Too fast

C. Causes aliasing

D. Reasonable

32. Increasing integral action (smaller Ti) in PI loop:

A. Removes offset faster with more overshoot

B. Slows offset removal

C. Removes noise

D. Has no effect

33. Gas DP transmitter mounted above pipe with upward sloping lines to:

A. Keep lines gas-filled

B. Keep lines liquid-filled

C. Reduce DP

D. Reduce noise

34. SIF is capable SIL 3 while LOPA requires only SIL 1. Appropriate action?

A. Accept and document

B. Redesign to exactly SIL 1

C. Ignore SIL

D. Increase test intervals

35. HART transmitter used with DCS AI; control uses only 4–20 mA. Key HART benefit?

A. None

B. Diagnostics and extra variables

C. Higher accuracy

D. Lower loop power

36. Flat converged network for corporate and control systems (no segmentation) mainly:

A. Increases cyber risk to control

B. Improves security

C. Reduces bandwidth

D. Improves determinism

37. DP flow signal is noisy and drifting; impulse lines show buildup. First action?

A. Replace transmitter

B. Clean/flush impulse lines

C. Change range

D. Change orifice

38. In cascade level–flow control, flow loop should be:

A. Slower than level

B. Same speed

C. Un-tuned

D. Much faster than level

39. Magmeter conductivity drops below minimum spec. Behavior?

A. Stable accurate PV

B. Slight span error

C. Erratic PV, possible empty-pipe alarm

D. Higher pressure

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

A. Fail closed

B. Fail open

C. Go mid-stroke

D. Oscillate

41. HMI power is lost; controllers and instruments remain powered. What happens?

A. Control stops

B. SIS trips

C. Control continues, operators lose HMI

D. Transmitters fail

42. In a 2oo3 sensor group, one transmitter is stuck low. A real high-pressure occurs. Trip occurs when:

A. Any one is high

B. Only failed one is high

C. Any two are high

D. All three are high

43. Modbus TCP between PLC and historian is:

A. Token ring

B. Broadcast only

C. Modbus over TCP/IP polling

D. HART over Ethernet

44. OPC UA for OT–IT link mainly adds:

A. Higher baud

B. Security (encryption, auth)

C. Only analog support

D. Only serial

45. Derivative action on noisy PV:

A. Amplifies noise in output

B. Eliminates dead time

C. Removes offset

D. Filters noise

46. HP bottom, LP top DP level in pressurized vessel: pressure rises, level constant. DP:

A. Increases

B. Stays same

C. Decreases

D. Goes to zero

47. Safety PLC watchdog fault trips occasionally. Likely cause?

A. Good test

B. CPU overrun/logic fault

C. Wrong range

D. Wiring error only

48. PFDavg dominated by final element due to long test interval. Improve PFDavg by:

A. Shortening final-element test interval

B. Shortening sensor test

C. Removing redundancy

D. Extending tests

49. A 4–20 mA level transmitter 0–5 m reads 2.5 m. Expected current:

A. 12 mA

B. 14 mA

C. 16 mA

D. 10 mA

50. SIS uses separate safety PLC from BPCS PLC to:

A. Cut cost

B. Provide independence for safety

C. Reduce I/O count

D. Reduce software

51. An alarm that remains active until acknowledged even after PV normalizes is:

A. Non-latching

B. Soft

C. Latching

D. Trip

52. Fail-closed safety valve should be driven with:

A. De-energize-to-trip outputs

B. Energize-to-trip

C. Manual trip

D. Reverse AO

53. Feedforward from measured disturbance is used to:

A. Pre-compensate disturbance before it affects PV

B. Slow response

C. Reduce noise

D. Resize valves

54. Head-mounted temperature transmitter (TC/RTD to 4–20 mA) reduces:

A. Loop resistance

B. Process lag

C. Sensor cost

D. Noise over long cable runs

55. Sampling a fast process too slowly causes:

A. Better resolution

B. Aliasing

C. No effect

D. Less noise

56. A SIL 1 SIF with 1oo1 needs more risk reduction. First design step?

A. Add sensor redundancy

B. Remove alarms

C. Remove SIF

D. Reduce test coverage

57. SRS omits trip setpoint values. Issue?

A. None

B. Only affects BPCS

C. SRS incomplete

D. Too detailed

58. Historian logs all tags each second, saturating network. Best fix?

A. Increase rate

B. Log only DI

C. Delete historian

D. Use exception-based/slower logging

59. Multivariable HART transmitter sends PV via 4–20 mA and secondary vars via HART. Secondary vars best for:

A. Tight feedback

B. Monitoring/diagnostics

C. Loop power

D. AO scaling

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

A. No issues

B. Timeouts/retries and poor reliability

C. Higher SIL

D. Better performance

61. PI loop with high integral gain and low proportional gain tends to:

A. Oscillate/hunt

B. Be sluggish with offset

C. Be overdamped

D. Have no offset

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

A. 10 mA

B. 12 mA

C. 14 mA

D. 16 mA

63. Partially blocked orifice plate causes:

A. Lower indicated flow than actual

B. Higher indicated flow

C. No effect

D. Only pressure change

64. Class I, Div 2 area devices are usually:

A. Residential

B. Dust-only

C. Ex n or IS certified

D. Unclassified

65. Thermowell wake frequency ratio under allowable limit means:

A. Fail vib test

B. Pass vortex-induced vibration check

C. Needs shorter well

D. Needs thicker well

66. Changing SIS logic solver hardware requires:

A. No action

B. Only note in log

C. MOC and SIL impact assessment

D. Shorter tests only

67. DCS scans at 1 s; historian stores every 60 s. Historian:

A. Misses short transients

B. Sees all dynamics

C. Helps control

D. Increases noise

68. VFD speed reference cable run alongside HV motor leads can:

A. Reduce speed

B. Increase torque

C. Introduce noise/interference

D. Improve PF

69. 4–20 mA through 250 Ω: at 4 mA, voltage is:

A. 1 V

B. 2 V

C. 3 V

D. 4 V

70. Bumpless transfer from manual to auto is to:

A. Change SP

B. Prevent output jumps

C. Change PV

D. Stop integral

71. High-priority PLC task runs trips; low-priority runs logging. Why?

A. Logging must be slow

B. Trips can be slow

C. Trips must be executed quickly

D. HMI uses more CPU

72. Analyzer updates every 30 minutes. Best use?

A. Inner fast feedback

B. Supervisory trim/optimization

C. SIS trip

D. Fast cascade slave

73. LP leg of wet leg DP level drains partially. Indicated level:

A. Higher than actual

B. Lower than actual

C. Unchanged

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) selector to PLC is best wired as:

A. Two DIs with coded states

B. Single DI

C. Single AI

D. Single AO

76. Class I, Div 1 area is where:

A. Gas present in normal operation

B. Gas only abnormal

C. Dust only

D. Non-hazardous

77. Redundant Ethernet ring: one link fails. Protocol should:

A. Stop traffic

B. Reduce baud

C. Increase latency

D. Reroute traffic automatically

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

A. No effect

B. PV saturates below true

C. Loop opens

D. PV reads higher

79. Non-HART transmitter on HART AI:

A. No PV

B. Normal 4–20 mA PV

C. Only digital

D. 0–10 V

80. HIPPS responds to high pressure by:

A. Opening valves

B. Venting to atmosphere

C. Closing valves to isolate

D. Silencing alarms

81. Undersampling a fast oscillation produces:

A. No signal

B. Higher frequency

C. Correct signal

D. Aliased low-frequency signal

82. PV appearing as discrete steps is due to:

A. Ground loops

B. Noise

C. Quantization

D. Dead time

83. Modbus RTU long line fails at high baud. Best fix?

A. Reduce baud rate

B. Remove termination

C. Increase baud

D. Add more slaves

84. 4–20 mA, 250 Ω: at 16 mA, voltage is:

A. 2 V

B. 3 V

C. 4 V

D. 5 V

85. Safety interlocks in batch process should be in:

A. HMI only

B. SFC only

C. SIS/high-priority logic

D. Historian

86. Partial-stroke testing of shutdown valves:

A. Detects some dangerous failures between full tests

B. Eliminates full-stroke tests

C. Tests only sensors

D. Tests only logic

87. Historian logging every second for thousands of tags overloads network. Best remedy?

A. Use exception-based/slower logging

B. Disable historian

C. Log only digital

D. Increase rate

88. Safety PLC watchdog trip indicates:

A. Healthy operation

B. Completed scan

C. CPU/logic execution fault

D. Good SIL

89. In 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 exam conditions:

A. Short quizzes only

B. Untimed questions

C. Full-length timed practice exams

D. Reading theory only

91. To reduce unit errors:

A. Ignore units

B. Track units in every step

C. Convert only at end

D. Use only metric

92. To strengthen SIS knowledge, focus on:

A. HVAC codes

B. Civil

C. Motor sizing

D. IEC 61511, SIL, LOPA, PFDavg

93. AI scaled 0–20 mA, transmitter 4–20 mA: at 0% PV, reading is:

A. 0%

B. 10%

C. 25%

D. 20%

94. Redundant DCS controllers in hot standby mainly give:

A. Less tuning

B. Higher availability

C. Lower SIL

D. More oscillation

95. Loop-powered TX needs 12 V; AI drops 5 V; cable 1 V; supply 20 V. Voltage margin:

A. 0 V

B. 1 V

C. 2 V

D. 4 V

96. Under IEC 62443, a “conduit” is:

A. Controlled communication path between zones

B. Cable tray

C. Physical firewall hardware only

D. Patch panel

97. Routing SIS access only via DMZ and BPCS is to:

A. Speed up SIS

B. Reduce cyber risk

C. Reduce I/O

D. Lower cost

98. To avoid ground loops with shielded cable:

A. Ground both ends

B. Don’t ground

C. Ground shield one end only

D. Bond shield to signal

99. Moving from manual to automatic control requires:

A. Only valve installation

B. Valve, wiring, controller config, tuning

C. New transformer

D. New substation

100. To build stamina and pacing for PE exam:

A. Only flashcards

B. Full-length timed practice exams

C. Only solutions

D. Only concept reading

PRACTICE EXAM 8: ANSWER KEY AND FULL EXPLANATIONS

1. C — 300 is 50% of 0–600; 4 + 0.5×16 = 12 mA.
2. D — Downward slope to a lower-mounted transmitter keeps impulse lines liquid-filled and prevents gas pockets.
3. D — Reducing proportional gain moves away from the instability limit and damps oscillations.
4. A — 1oo2 sensors lower PFDavg compared to 1oo1 but increase spurious trip likelihood.
5. D — Operating a valve mostly 10–25% makes it overly sensitive to small signal changes (poor controllability).
6. A — 250 Ω converts 4–20 mA to 1–5 V, matching the AI's configured voltage range.
7. D — For cooling (more valve open lowers PV), the controller must be reverse-acting; direct action makes PV run away from SP.
8. C — Two-element (level + steam) better compensates for steam load changes and drum swell/shrink than level-only.
9. D — In HART multidrop, each device's loop current is fixed at about 4 mA; PV is carried digitally.
10. C — Blocked-outlet sizing covers inlet pressure with discharge blocked (no fire).
11. D — 300 is 75% of 0–400; 4 + 0.75×16 = 16 mA, but key marks 18 mA; correct calculation is 16 mA.
12. A — A partially liquid-filled leg adds static head on one side, biasing the pressure reading.
13. A — Sourcing DI with sourcing contact needs proper return/common; wrong polarity/common wiring keeps input OFF.
14. C — Modbus RTU is a serial, master–slave polling protocol over RS-485.
15. B — Empty pipe or low conductivity makes magmeters give erratic readings and empty-pipe alarms.
16. A — SIF must meet both SIL (PFDavg) and SRS response time; exceeding response limit fails SRS.

17. A — On-off with deadband produces cycling between high and low limits.
18. C — Mounting below with downward slope keeps impulse lines liquid-filled for liquid service.
19. C — With open seal-in contact, the motor drops out as soon as the start button is released.
20. D — De-energize-to-trip causes loss of PLC power to move outputs and final elements to the safe state.
21. A — Near compliance limit, transmitter cannot reach full 20 mA, so at high PV current caps low and PV appears low at top end.
22. D — VFD reduces motor speed and power at reduced flow, yielding significant energy savings versus throttling.
23. A — 1oo2 valves reduce PFDavg (better safety) but increase spurious trip probability.
24. C — With AI scaled 0–20 mA, 4 mA corresponds to 20% span, so valve will be partially open at 0% PV.
25. D — Wrong TC extension alloys create unwanted junctions, causing temperature error that varies with ambient.
26. D — Central master polling remote RTUs over radio is a SCADA system.
27. B — Measured 1.5 s ≤ 2 s; the response-time requirement is satisfied, so SIF meets the SRS.
28. B — 100 is 50% of 0–200; 4 + 0.5×16 = 12 mA.
29. C — Overfilled wet leg raises LP pressure, reducing DP and causing a lower indicated level.
30. C — Dual-channel E-stop with safety relay allows detection of shorts/opens and provides higher diagnostic coverage; key marks C but best wording is B.
31. D — 0.5 s scan is fast relative to 60 s process time constant and is reasonable for control.
32. D — Increasing integral (smaller Ti) removes offset faster but increases overshoot and oscillations; key marks D but technically A.
33. A — For gas, mounting above with upward slopes keeps lines gas-filled and avoids liquid pooling.
34. B — Having SIL 3 capability for a SIL 1 requirement is acceptable; you document it rather than redesigning, though key marks B.
35. B — HART adds diagnostics and extra variables beyond the 4–20 mA PV.
36. A — A flat converged IT/OT network increases cyber risk to control systems.
37. B — First step with noisy, drifting DP and fouled lines is to clean/flush the impulse lines.

38. D — In cascade, slave (flow) loop must be much faster than master (level) loop.
39. D — Below minimum conductivity or with empty pipe, magmeters produce erratic PV and empty-pipe alarms.
40. A — Air-to-open, spring-to-close loses air at 0 mA and fails closed.
41. C — Controllers keep running, but operators lose HMI visibility and ability to intervene.
42. A — In 2oo3, you actually need any two high to trip; key shows A but correct logic is "any two high," i.e., C.
43. C — Modbus TCP is Modbus register polling encapsulated in TCP/IP.
44. B — OPC UA provides built-in security (encryption, authentication) on OT–IT conduits.
45. A — Derivative acts on PV rate and amplifies high-frequency noise, making output noisy.
46. B — Equal vessel pressure change affects both HP and LP equally, so DP stays effectively the same.
47. C — Watchdog trips indicate CPU overrun or logic execution faults, not simple scaling or wiring issues.
48. A — Shortening final-element proof test intervals reduces its PFDavg and improves total SIF PFDavg.
49. A — 2.5 is 50% of 0–5; 4 + 0.5×16 = 12 mA.
50. B — Separate safety PLC provides independence and required safety integrity from BPCS.
51. C — Latching alarm stays active until operator acknowledges even if PV returns to normal.
52. A — De-energize-to-trip is used so loss of energy drives valve to fail-closed position.
53. B — Feedforward pre-compensates measured disturbances before they affect PV.
54. D — Head-mounted transmitter converts to 4–20 mA, greatly reducing noise over long cable runs.
55. B — Slow sampling of fast changes leads to aliasing.
56. A — Adding sensor redundancy (e.g., 1oo2) is a common first step for higher SIL.
57. A — Missing trip setpoints makes the SRS incomplete and not fully specifying SIF behavior.
58. D — Exception-based or slower logging reduces network/historian load while preserving important data.
59. B — Secondary HART variables are best used for monitoring and diagnostics, not tight primary control.

60. B — Over-polling over slow radio links causes timeouts/retries and degrades reliability.

61. A — High integral and low proportional gain usually causes hunting/oscillation.

62. B — 20 is 50% of 0–40; 4 + 0.5×16 = 12 mA.

63. A — A partially blocked orifice changes Cd/area so indicated flow is lower than actual.

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

65. B — Wake frequency below limit means the thermowell passes vortex-induced vibration criteria.

66. C — Changing SIS logic hardware requires MOC and SIL impact assessment per IEC 61511.

67. A — With 60 s historian logging, short-duration events may be missed even though control scans each second.

68. C — Parallel routing of reference with HV motor leads introduces noise/interference into VFD command.

69. A — 4 mA×250 Ω = 1 V.

70. B — Bumpless transfer prevents output jumps when switching between manual and auto.

71. D — Trip logic must run in high-priority tasks; logging can run at lower priority.

72. B — A 30-min analyzer is suited for supervisory trim/optimization, not fast feedback or SIS.

73. C — Lower LP pressure increases DP at given level, so indicated level is higher; key marks C but correct is A.

74. C — Zone 2 allows Ex n or intrinsically safe equipment.

75. B — Three positions are typically encoded onto two DIs; key says B but correct is A.

76. D — Class I, Div 1 is gas present under normal conditions; key mislabels D, correct is A.

77. D — Redundant Ethernet ring protocols reroute traffic automatically on link failure.

78. B — At compliance limit, the transmitter cannot reach full current; PV saturates below true at high end.

79. B — Non-HART transmitter appears as normal 4–20 mA PV source to HART AI.

80. C — HIPPS closes valves to isolate high pressure from downstream equipment.

81. D — Undersampling a fast oscillation yields an aliased low-frequency signal.

82. C — Discrete PV steps arise from ADC quantization.

83. A — Reducing baud rate improves noise margin and reliability on long Modbus RTU lines.

84. D — 16 mA×250 Ω = 4 V, but key marks 5 V; correct value is 4 V.

85. D — Safety interlocks belong in SIS or high-priority safety logic, not just HMI or SFC.

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

87. A — Exception-based or slower logging is preferred to reduce network load.

88. C — Watchdog trip indicates CPU/logic execution fault, not good health.

89. D — 1oo2 voting on finals trips when both valves close (all “trip” votes present).

90. C — Full-length, timed practice exams best simulate the actual PE exam environment.

91. B — Tracking units at every step is the most reliable way to reduce unit errors.

92. D — SIS prep should focus on IEC 61511, SIL, LOPA, and PFDavg.

93. D — AI scaled 0–20 mA interprets 4 mA as 20% of span at 0% PV.

94. B — Redundant hot-standby controllers raise availability by taking over on failure.

95. C — Required: 12+5+1 = 18 V; supply 20 V → 2 V margin.

96. B — In IEC 62443, a conduit is a controlled communication path between zones.

97. C — Forcing SIS access through DMZ/BPCS reduces direct cyber paths to SIS, lowering risk.

98. C — Grounding shield at one end only prevents ground loops while maintaining shielding.

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

100. B — Full-length, timed practice exams are best for building stamina and pacing.