

PRACTICE EXAM 4: T4 SIMULATION

(50 QUESTIONS)

1. The progressive failure pattern of a heavy-duty truck air compressor with worn piston rings typically begins with:

- A. Sudden complete loss of air pressure during normal vehicle operation
- B. External leakage from the compressor housing during normal operation
- C. Loss of all forward gears requiring complete transmission replacement
- D. Oil contamination in the discharge air, then accelerated air dryer saturation, then valve sticking

2. A heavy-duty truck arrives with a complaint of "service brakes apply slowly during pedal application." All air pressures verify within specification. The most likely cause is:

- A. A failed coolant temperature sensor reading falsely cold to the engine ECM
- B. Restricted air line between the treadle valve and the brake chambers during operation
- C. Excessive transmission fluid level above the maximum fill mark indication
- D. Worn ring and pinion gears in the rear drive axle assembly during operation

3. The LEAST likely consequence of operating a heavy-duty truck with continuous compressor cycling beyond normal frequency is:

- A. Loss of vehicle steering control during normal highway operation conditions
- B. Accelerated compressor wear from increased operating cycle frequency
- C. Excessive heat buildup in the air dryer during continuous purge cycles
- D. Reduced fuel economy from increased compressor load on the engine

4. The progressive damage pattern of a heavy-duty air dryer that has reached desiccant saturation typically follows:

- A. Sudden complete air system failure with no warning during operation
- B. External leakage from the air dryer body during normal operation conditions
- C. Moisture passes through to supply tank, then valve corrosion, then progressive component failure
- D. Loss of all forward gears requiring complete transmission replacement during service

5. A heavy-duty truck driver reports that the air brake low-pressure warning light "comes on every time I use the brakes hard for more than 30 seconds." The most likely cause is:

- A. Failed compressor producing zero output during all operating conditions
- B. Stuck-open compressor unloader preventing system pressure development
- C. Excessive transmission fluid level above the maximum fill mark indication
- D. Excessive air demand during heavy braking with marginal compressor output capacity

6. The most likely cause of a heavy-duty truck air brake system that builds pressure normally to 100 PSI but cannot reach the cut-out pressure of 125 PSI is:

- A. Air leakage at higher pressure that exceeds compressor delivery at that pressure range
- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. Excessive transmission fluid level above the maximum fill mark indication
- D. Worn ring and pinion gears in the rear drive axle assembly during operation

7. Technician A says glad hands on tractor-trailer connections include color-coded service (red) and emergency (blue) connections. Technician B says glad hands on tractor-trailer connections include color-coded service (blue) and emergency (red) connections. Who is correct?

- A. Technician A only

- B. Technician B only
- C. Both Technician A and Technician B
- D. Neither Technician A nor Technician B

8. The proper diagnostic priority when a heavy-duty truck shows a complaint of "trailer brakes apply more aggressively than tractor brakes during normal pedal application" is to:

- A. Replace the trailer brake control valve as preventive maintenance during the same service
- B. Apply battery voltage to the trailer brake system for diagnostic testing during service
- C. Verify proper trailer brake balance through a graduated brake application road test
- D. Continue operation since brake imbalance has minimal effect on vehicle safety

9. The most likely consequence of operating a heavy-duty truck with the trailer brake hand valve held during normal driving operation is:

- A. Improved fuel economy from reduced rolling resistance during normal operation
- B. No effect on the trailer brake system during normal operating conditions
- C. Faster brake response during normal service brake application events
- D. Trailer brake overheating, accelerated lining wear, and possible brake fade

10. The progressive damage pattern from operating with continuous low system air pressure typically follows:

- A. Reduced reserve capacity, then service brake response degradation, then automatic spring brake application
- B. Sudden complete brake system failure with no warning during normal operation
- C. Loss of all forward gears requiring complete transmission replacement during service
- D. External leakage requiring complete air system replacement during the same service

11. The LEAST likely cause of a heavy-duty air brake system that produces excessive moisture in the supply reservoir is:

- A. Failed air dryer cartridge unable to remove moisture from compressed air
- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. Operation in extended high-humidity conditions during heavy compressor cycling
- D. Worn compressor piston rings allowing combustion gas blow-by during operation

12. The most accurate description of tractor protection valve operation is:

- A. Modulates air pressure to the trailer service brake circuit during normal operation
- B. Filters compressed air before delivery to the trailer brake circuit during operation
- C. Provides parking brake force application during spring brake engagement events
- D. Closes the supply line and applies trailer brakes if tractor air pressure drops critically

13. The proper diagnostic approach when a heavy-duty tractor shows a complaint of "intermittent loss of trailer braking during pedal application" is to:

- A. Verify glad hand connections, tractor protection valve operation, and supply line integrity
- B. Apply battery voltage to the trailer brake system for diagnostic testing during service
- C. Replace the trailer brake control valve as preventive maintenance during service
- D. Continue operation since intermittent symptoms have minimal effect on safety

14. The most likely cause of a heavy-duty tractor that shows premature foundation brake wear on the steer axle compared to the drive axles is:

- A. Worn ring and pinion gears in the rear drive axle assembly during operation
- B. A failed coolant temperature sensor reading falsely cold to the engine ECM

- C. Improper brake balance from quick release valve, relay valve, or proportioning issue
- D. Excessive transmission fluid level above the maximum fill mark indication

15. The proper service action when a heavy-duty truck air brake system shows audible air leakage from the brake chamber area on one wheel position only is to:

- A. Continue operation since single-wheel leakage has minimal effect on overall function
- B. Inspect the brake chamber for diaphragm damage, fitting damage, or chamber housing crack
- C. Apply battery voltage to the brake chamber for diagnostic testing during service
- D. Replace all brake chambers on the truck as preventive maintenance during service

16. The LEAST likely cause of a heavy-duty foundation brake that shows uneven lining wear between leading and trailing shoes is:

- A. A failed coolant temperature sensor reading falsely cold to the engine ECM
- B. Damaged or worn cam roller affecting shoe contact during application events
- C. Failed shoe return spring affecting shoe retraction during release operations
- D. S-cam wear affecting shoe spreading geometry during application events

17. The progressive damage pattern from a heavy-duty foundation brake operating with worn lining beyond service specification typically follows:

- A. Sudden complete loss of stopping ability with no warning during operation
- B. External lubricant leakage requiring complete brake system replacement during service
- C. Loss of all forward gears requiring complete transmission replacement during service
- D. Increased pushrod stroke, then drum scoring, then complete brake failure if ignored

18. A heavy-duty truck driver reports that "the brakes pull to the right under heavy application but track straight under light application." The most likely cause is:

- A. A failed coolant temperature sensor reading falsely cold to the engine ECM
- B. Asymmetric brake force from contaminated lining, restricted line, or seized component on left side
- C. Worn ring and pinion gears in the rear drive axle assembly during operation
- D. Excessive transmission fluid level above the maximum fill mark indication

19. The most likely cause of a heavy-duty foundation brake that shows hot drum on one wheel position only after a normal driving cycle is:

- A. Dragging brake from failed slack adjuster, return spring, or seized cam roller
- B. Worn ring and pinion gears in the rear drive axle assembly during operation
- C. Excessive transmission fluid level above the maximum fill mark indication
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

20. The proper diagnostic approach when a heavy-duty truck shows a complaint of "brake fade during long downhill descents" is to:

- A. Replace all brake chambers as preventive maintenance during the same service event
- B. Apply battery voltage to the brake system for diagnostic testing during service
- C. Verify proper brake adjustment, lining condition, drum condition, and engine brake operation
- D. Continue operation since brake fade is normal during heavy braking conditions

21. The most likely cause of a heavy-duty truck that shows a brake chamber pushrod stroke of 2.5 inches on a Type 30 chamber is:

- A. A failed coolant temperature sensor reading falsely cold to the engine ECM

- B. Excessive transmission fluid level above the maximum fill mark indication
- C. Brake out of adjustment, worn lining, or failed automatic slack adjuster
- D. Worn ring and pinion gears in the rear drive axle assembly during operation

22. The proper service action when a heavy-duty truck foundation brake shows a brake chamber pushrod stroke that exceeds CVSA out-of-service criteria is to:

- A. Service the foundation brake immediately before returning the truck to service
- B. Continue operation since CVSA criteria have minimal effect on actual brake performance
- C. Apply battery voltage to the brake chamber for diagnostic testing during service
- D. Document the finding and address at the next scheduled preventive maintenance interval

23. The LEAST likely cause of premature lining wear at all wheel positions on a heavy-duty truck is:

- A. Operation with excessive load weight beyond truck rated capacity during operation
- B. Aggressive driver braking technique during normal operation conditions
- C. Improperly adjusted brakes producing dragging conditions during operation
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

24. The progressive damage pattern from operating with a contaminated brake drum that shows hot spots and heat checks typically follows:

- A. Sudden complete brake failure with no warning during normal operation conditions
- B. Reduced friction coefficient, then drum cracking, then catastrophic drum failure if ignored
- C. Loss of all forward gears requiring complete transmission replacement during service
- D. External lubricant leakage requiring complete brake system replacement during service

25. The most likely cause of a heavy-duty foundation brake that shows brake lining contaminated with engine coolant after a recent overheating event is:

- A. Worn ring and pinion gears in the rear drive axle assembly during operation
- B. Excessive transmission fluid level above the maximum fill mark indication
- C. Failed wheel hub seal or coolant leak that reached the brake assembly during operation
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

26. The proper service action when a heavy-duty foundation brake drum shows cracks visible during inspection is to:

- A. Replace the brake drum and inspect adjacent components for related damage
- B. Continue operation since minor drum cracks have minimal effect on brake performance
- C. Apply battery voltage to the drum for diagnostic testing during the service event
- D. Resurface the drum to remove the cracks during the same service event

27. The most accurate description of slack adjuster geometry effect on brake performance is:

- A. Longer slack adjusters reduce brake torque applied during normal operation
- B. Slack adjuster length has minimal effect on brake performance during operation
- C. Slack adjuster length affects only brake adjustment frequency during service
- D. Longer slack adjusters increase mechanical advantage and brake torque applied

28. The proper procedure when a heavy-duty truck shows a complaint of "brakes squeal during light application but operate normally during heavy braking" is to:

- A. Continue operation since brake squeal has minimal effect on stopping performance
- B. Replace all brake shoes as preventive maintenance during the same service event

- C. Inspect lining condition, drum surface condition, and verify proper adjustment
- D. Apply battery voltage to the brake system for diagnostic testing during service

29. The LEAST likely cause of a heavy-duty foundation brake that shows brake fade during sustained heavy braking is:

- A. Worn or contaminated lining reducing friction coefficient during heavy use
- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. Glazed or oversized drums reducing heat dissipation during heavy use
- D. Inadequate brake adjustment producing reduced contact area during application

30. The most likely cause of a heavy-duty truck spring brake chamber that shows an air leak during parking brake engagement is:

- A. Worn ring and pinion gears in the rear drive axle assembly during operation
- B. Excessive transmission fluid level above the maximum fill mark indication
- C. A failed coolant temperature sensor reading falsely cold to the engine ECM
- D. Damaged spring brake chamber diaphragm allowing air leakage during operation

31. The proper diagnostic approach when a heavy-duty truck shows a complaint of "parking brake will not hold the truck on a grade" is to:

- A. Verify spring brake chamber operation, foundation brake adjustment, and lining condition
- B. Apply battery voltage to the parking brake system for diagnostic testing during service
- C. Replace the parking brake control valve as preventive maintenance during service
- D. Continue operation since parking brake hold-grade ability has minimal effect on safety

32. The progressive damage pattern from continued operation with a partially engaged parking brake typically follows:

- A. Loss of all forward gears requiring complete transmission replacement during service
- B. External lubricant leakage requiring complete brake system replacement during service
- C. Sudden complete parking brake failure with no warning during normal operation
- D. Drag, then heat buildup, then accelerated lining wear, then potential drum damage

33. The LEAST likely cause of a heavy-duty truck parking brake that fails to fully release after the operator pulls the dash valve is:

- A. Failed parking brake control valve unable to direct air to the chambers properly
- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. Damaged air supply line to the spring brake chamber preventing full pressure
- D. Insufficient air pressure to overcome the spring force in the chamber

34. The proper service action when a heavy-duty truck shows a complaint of "parking brake spontaneously applies during highway operation" is to:

- A. Continue operation since spontaneous parking brake has minimal effect on safety
- B. Apply additional air pressure to release the parking brakes during normal operation
- C. Investigate air pressure loss source, valve operation, and supply line integrity
- D. Replace the parking brake control valve as the most likely failure component during service

35. The progressive damage pattern from operating with hydraulic brake fluid contaminated with moisture typically follows:

- A. Reduced boiling point, then brake fade during heavy use, then internal corrosion damage

- B. Loss of all forward gears requiring complete transmission replacement during service
- C. Sudden complete brake failure with no warning during normal operation conditions
- D. External lubricant leakage requiring complete brake system replacement during service

36. The most likely cause of a heavy-duty hydraulic brake system that shows brake pedal that drops slowly with the engine off is:

- A. Insufficient brake fluid level in the master cylinder reservoir during operation
- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. Worn ring and pinion gears in the rear drive axle assembly during operation
- D. Internal master cylinder seal bypass allowing fluid leakage past the seal

37. The proper diagnostic priority when a heavy-duty hydraulic brake system shows external fluid leakage at multiple wheel cylinder positions is to:

- A. Continue operation since multiple-cylinder leakage has minimal effect on brake performance
- B. Investigate brake fluid contamination as a common cause of seal damage at all cylinders
- C. Apply battery voltage to the wheel cylinders for diagnostic testing during service
- D. Replace one wheel cylinder at a time to determine which is the actual failed component

38. The LEAST likely cause of a hydraulic brake system that produces a hard pedal with reduced braking force is:

- A. Severely worn or contaminated brake lining reducing friction coefficient at the wheels
- B. Brake booster failure reducing pedal-to-line pressure assist during application
- C. A failed coolant temperature sensor reading falsely cold to the engine ECM
- D. Restricted brake hose limiting fluid flow to one or more wheel cylinders

39. The most likely cause of an air-over-hydraulic brake system that shows weak braking despite proper air supply pressure is:

- A. Failed air-hydraulic actuator unable to develop proper hydraulic pressure during application
- B. Worn ring and pinion gears in the rear drive axle assembly during operation
- C. Excessive transmission fluid level above the maximum fill mark indication
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

40. The progressive damage pattern from operating with worn ABS wheel speed sensors that produce intermittent signals typically follows:

- A. Sudden complete brake system failure with no warning during normal operation
- B. External lubricant leakage requiring complete brake system replacement during service
- C. Loss of all forward gears requiring complete transmission replacement during service
- D. Intermittent ABS function, then permanent ABS warning, then loss of ABS protection

41. The proper diagnostic approach when an ABS system sets fault codes for multiple wheel speed sensors after recent service is to:

- A. Replace all wheel speed sensors immediately as the most likely failure component
- B. Apply battery voltage to the ABS controller for diagnostic testing during service
- C. Inspect for service-related damage, sensor air gap issues, or wiring damage during the recent work
- D. Continue operation since recent-service-related faults have minimal effect on operation

42. The LEAST likely cause of an ABS system that sets a wheel speed sensor fault on one wheel only is:

- A. A failed coolant temperature sensor reading falsely cold to the engine ECM
- B. Damaged tone ring producing inconsistent signal at the affected wheel position

- C. Wheel speed sensor wiring damage at the affected wheel during operation
- D. Excessive air gap between sensor and tone ring at the affected wheel position

43. The most accurate description of ABS modulator valve operation during ABS-active braking is:

- A. Continuously closed during all ABS-active braking events without any modulation
- B. Continuously open during all ABS-active braking events without any modulation
- C. Manual operation by the driver during ABS-active braking events during operation
- D. Rapid open-close cycling controlled by the ABS controller to modulate brake pressure

44. The proper service action when a heavy-duty truck ABS system shows a fault code that returns immediately after clearing during diagnostic service is to:

- A. Continue clearing the fault code repeatedly until it remains cleared during service
- B. Investigate the underlying cause rather than continuing to clear without correction
- C. Replace the ABS controller as the most likely failure component during service
- D. Apply battery voltage to the ABS controller for diagnostic testing during service

45. The most likely cause of a heavy-duty truck hydraulic brake system that pulls to one side during application is:

- A. Insufficient brake fluid level in the master cylinder reservoir during operation
- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. Restricted brake hose, contaminated lining, or seized caliper on the affected side
- D. Worn ring and pinion gears in the rear drive axle assembly during operation

46. The proper diagnostic priority when a heavy-duty hydraulic brake system shows a complaint of "spongy pedal that does not improve after bleeding" is to:

- A. Inspect for failed brake hose with internal damage allowing expansion under pressure
- B. Continue operation since bleeding has minimal effect on persistent spongy pedal
- C. Replace the master cylinder as the most likely failure component during service
- D. Apply battery voltage to the brake system for diagnostic testing during service

47. The LEAST likely consequence of operating a heavy-duty hydraulic brake system with hygroscopic moisture absorption beyond manufacturer service interval is:

- A. Reduced fluid boiling point causing brake fade during sustained heavy braking
- B. Internal corrosion damage to wheel cylinders, master cylinder, and brake lines
- C. Increased risk of vapor lock during heavy braking on long downhill descents
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

48. The proper service action when a heavy-duty hydraulic brake system shows fluid contamination during analysis is to:

- A. Continue operation since fluid contamination has minimal effect during normal operation
- B. Flush the entire hydraulic brake system and refill with proper specification fluid
- C. Apply battery voltage to the master cylinder for diagnostic testing during service
- D. Add additional fluid to dilute the contamination during the same service event

49. The most likely cause of an ABS system that activates during normal light brake applications when no wheel slip is occurring is:

- A. Worn ring and pinion gears in the rear drive axle assembly during operation

- B. Excessive transmission fluid level above the maximum fill mark indication
- C. Failed wheel speed sensor producing inconsistent signal during normal operation
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

50. The progressive damage pattern from operating with contaminated hydraulic brake fluid that has not been replaced per service interval typically follows:

- A. Loss of all forward gears requiring complete transmission replacement during service
- B. Reduced boiling point, then brake fade, then internal corrosion, then component failure
- C. External lubricant leakage requiring complete brake system replacement during service
- D. Sudden complete brake failure with no warning during normal operation conditions

ANSWER KEY AND EXPLANATIONS

1. D — Oil contamination in the discharge air, then accelerated air dryer saturation, then valve sticking. Worn compressor piston rings allow oil past the rings into the discharge air stream, contaminating the air dryer (saturating the desiccant prematurely) and downstream valves (causing sticking from oil residue). Each stage progresses to the next without intervention, eventually compromising the entire air brake system.
2. B — Restricted air line between the treadle valve and the brake chambers during operation. With pressures verifying within specification, slow brake application typically indicates restricted air flow somewhere between the treadle valve and the chambers. The restriction reduces air volume reaching the chambers within the application window, producing the slow apply symptom while pressure readings appear normal.
3. A — Loss of vehicle steering control during normal highway operation conditions. Continuous compressor cycling does not affect vehicle steering. The other choices all describe direct consequences: accelerated wear from increased cycle frequency, heat buildup from continuous purge cycles, and reduced fuel economy from increased compressor load on the engine.
4. C — Moisture passes through to supply tank, then valve corrosion, then progressive component failure. Saturated air dryer desiccant cannot remove moisture from compressed air, allowing water to pass through to the supply tank. Accumulated moisture then causes valve corrosion and progressive failure of downstream components. Recognition of early stages (moisture in supply tank) prevents the progressive damage phase.
5. D — Excessive air demand during heavy braking with marginal compressor output capacity. Low-pressure warnings during sustained heavy braking indicate the compressor cannot maintain pressure against the demand of repeated brake applications. The system normally has reserve capacity for occasional heavy use; a marginal compressor cannot replenish pressure fast enough during sustained demand.
6. A — Air leakage at higher pressure that exceeds compressor delivery at that pressure range. Pressure that builds normally to a point and then plateaus indicates a leak that opens or worsens at higher pressure, exceeding compressor delivery capacity at that pressure. The system reaches an equilibrium where compressor output equals leakage rate, preventing further pressure rise.
7. B — Technician B only. Glad hands on tractor-trailer connections use color-coded service (blue) and emergency (red) connections. The blue service line carries treadle valve output to apply trailer service brakes; the red emergency line maintains trailer system pressure and delivers emergency brake application if it is lost.

8. C — Verify proper trailer brake balance through a graduated brake application road test. Trailer brakes applying more aggressively than tractor brakes indicates brake imbalance that produces unsafe handling, particularly during heavy braking on slick surfaces. A graduated brake application road test verifies proper balance and identifies whether the issue is in the trailer brake control valve, proportioning, or trailer brake adjustment.
9. D — Trailer brake overheating, accelerated lining wear, and possible brake fade. Continuously applying the trailer brake hand valve during driving keeps trailer brakes partially applied, producing constant friction work that generates heat. The result is overheating, accelerated lining wear, and potential brake fade that compromises trailer braking when needed for actual stopping.
10. A — Reduced reserve capacity, then service brake response degradation, then automatic spring brake application. Continuous low system air pressure progressively reduces the system's ability to deliver consistent brake performance. As pressure drops further, service brake response degrades; if pressure falls below approximately 65 PSI, the spring brakes engage automatically, applying the parking brakes during operation.
11. B — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not produce moisture in the air supply reservoir. The other choices all describe direct sources of moisture: failed dryer cartridge, high-humidity operation, and worn compressor allowing moisture-laden combustion gas blow-by.
12. D — Closes the supply line and applies trailer brakes if tractor air pressure drops critically. The tractor protection valve protects the tractor air system if a trailer separates or if trailer pressure drops critically. The valve closes the supply line to the trailer (preserving tractor pressure) and applies trailer service brakes (slowing the separated trailer) when pressure conditions warrant protection.
13. A — Verify glad hand connections, tractor protection valve operation, and supply line integrity. Intermittent loss of trailer braking typically traces to glad hand connection issues (loose, damaged seals), tractor protection valve operation, or supply line integrity (chafing, cracking, intermittent leaks). Systematic verification of each component identifies the specific fault location.
14. C — Improper brake balance from quick release valve, relay valve, or proportioning issue. Premature steer axle wear compared to drive axles indicates the steer axle is doing more braking work than designed. Brake balance components (quick release valves, relay valves, proportioning) control how brake force is distributed; failures in these components shift work to the steer axle, accelerating its lining wear.
15. B — Inspect the brake chamber for diaphragm damage, fitting damage, or chamber housing crack. Single-wheel brake chamber leakage typically originates at that specific chamber. Inspection identifies whether the leak source is the diaphragm, fittings, or chamber housing, allowing targeted repair without unnecessary replacement of unaffected chambers.

16. A — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect foundation brake shoe wear patterns. The other choices all describe direct causes of uneven leading-trailing shoe wear: cam roller damage, return spring failure, and S-cam wear all affect shoe contact geometry during application.
17. D — Increased pushrod stroke, then drum scoring, then complete brake failure if ignored. Foundation brake operation with worn lining beyond service specification produces increased pushrod stroke (slack adjuster compensates, but limit is reached), then drum scoring (rivet heads contact drum surface), then complete brake failure (lining material lost, no friction surface). Recognition of the progressive pattern allows intervention before the complete failure stage.
18. B — Asymmetric brake force from contaminated lining, restricted line, or seized component on left side. Pull to the right under heavy braking with straight tracking under light braking indicates asymmetric brake force that becomes apparent under load. The opposite side (left, in this case) has a fault reducing its braking force; common causes include contaminated lining, restricted line, or seized cam roller.
19. A — Dragging brake from failed slack adjuster, return spring, or seized cam roller. Hot drum on one wheel position indicates that brake is doing more work than designed, typically from a dragging condition. The drag generates heat continuously during driving. Common causes include failed slack adjuster (over-adjusted), failed return spring (shoes don't fully retract), or seized cam roller (cam doesn't return).
20. C — Verify proper brake adjustment, lining condition, drum condition, and engine brake operation. Brake fade during long downhill descents typically indicates inadequate brake capacity from worn or contaminated lining, glazed or oversized drums, or improper adjustment. The engine brake should also be evaluated because proper engine braking reduces foundation brake load during descent, preventing fade.
21. C — Brake out of adjustment, worn lining, or failed automatic slack adjuster. A pushrod stroke of 2.5 inches on a Type 30 chamber exceeds the CVSA out-of-service criterion of 2 inches. The most likely causes are brake out of adjustment, worn lining beyond service specification, or failed automatic slack adjuster unable to compensate for normal wear.
22. A — Service the foundation brake immediately before returning the truck to service. CVSA out-of-service determination removes the truck from operation until the foundation brake is properly serviced. Continuing operation with out-of-service brakes is illegal and creates significant safety risk; the foundation brake must be serviced (adjustment, lining, or component replacement as needed) before the truck can return to service.
23. D — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect brake lining wear rates. The other choices all directly cause accelerated lining wear: overload increases braking work, aggressive driver braking increases friction work, and dragging brakes generate continuous heat and wear.

24. B — Reduced friction coefficient, then drum cracking, then catastrophic drum failure if ignored. Drum hot spots and heat checks indicate excessive thermal stress that progresses through reduced friction coefficient (glazed surfaces grip less effectively), then drum cracking as the thermal damage worsens, then catastrophic drum failure as cracks propagate through the drum wall. Recognition of early stages prevents the catastrophic failure stage.
25. C — Failed wheel hub seal or coolant leak that reached the brake assembly during operation. Coolant contamination of brake lining requires a path from the cooling system to the brake assembly. A failed wheel hub seal can allow coolant from a leaking head gasket or other source to reach the brake assembly. The contamination must be addressed at both the source and the affected components.
26. A — Replace the brake drum and inspect adjacent components for related damage. Cracked brake drums cannot be safely returned to service because cracks propagate during continued operation, eventually causing catastrophic drum failure. Replacement is required, and adjacent components (shoes, springs, slack adjuster) must be inspected for damage caused by the cracked drum's operation.
27. D — Longer slack adjusters increase mechanical advantage and brake torque applied. Slack adjuster length determines mechanical advantage between the brake chamber pushrod and the S-cam shaft. Longer slack adjusters provide greater leverage, increasing brake torque applied for a given chamber force. The length must match the chamber size and brake design for proper braking force.
28. C — Inspect lining condition, drum surface condition, and verify proper adjustment. Brake squeal during light application that disappears under heavy braking typically indicates surface conditions on the lining or drum, or improper adjustment that produces incomplete shoe contact at low pressures. Inspection identifies the specific cause for targeted repair.
29. B — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect brake fade during sustained heavy braking. The other choices all directly cause brake fade: worn or contaminated lining reduces friction, glazed or oversized drums reduce heat dissipation, and inadequate adjustment reduces contact area during application.
30. D — Damaged spring brake chamber diaphragm allowing air leakage during operation. Air leakage from a spring brake chamber during parking brake engagement typically indicates a damaged diaphragm allowing air to escape. The diaphragm separates the air pressure side from the spring side; damage allows air to leak past the seal, producing the audible leak.
31. A — Verify spring brake chamber operation, foundation brake adjustment, and lining condition. Parking brake hold-grade ability depends on adequate spring brake force at the chamber, proper foundation brake adjustment, and adequate lining condition. If any of these is compromised, the

parking brake cannot hold the truck on a grade. Systematic verification identifies the specific cause.

32. D — Drag, then heat buildup, then accelerated lining wear, then potential drum damage. Continued operation with a partially engaged parking brake produces drag (continuous friction during driving), heat buildup (from the friction work), accelerated lining wear (from the continuous work), and potential drum damage (from heat-induced thermal stress). Recognition of early stages prevents progression to drum damage.
33. B — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect parking brake operation. The other choices all directly prevent the spring brakes from fully releasing through inadequate pressure to overcome the spring force or failure of the air delivery path to the chambers.
34. C — Investigate air pressure loss source, valve operation, and supply line integrity. Spontaneous parking brake application during operation indicates rapid air pressure loss from the spring brake chambers. The cause must be identified — leak in supply lines, failed control valve, or major system pressure loss — to prevent recurrence and ensure safe operation.
35. A — Reduced boiling point, then brake fade during heavy use, then internal corrosion damage. Hydraulic brake fluid contaminated with moisture progresses through reduced boiling point (lower temperature for vapor formation), then brake fade during heavy use (vapor forms in lines, compromising hydraulic transmission), then internal corrosion damage to wheel cylinders, master cylinder, and brake lines from the moisture.
36. D — Internal master cylinder seal bypass allowing fluid leakage past the seal. A pedal that drops slowly with engine off indicates fluid bypassing internal master cylinder seals under steady pressure. The bypass allows fluid to leak past the seal slowly, producing the gradual pedal drop. External fluid loss would show visible leakage or low reservoir level.
37. B — Investigate brake fluid contamination as a common cause of seal damage at all cylinders. Multiple-cylinder external leakage simultaneously suggests a common cause rather than independent failures. Fluid contamination (moisture, debris, or chemical incompatibility) damages all wheel cylinder seals, causing leakage at multiple locations. Investigation of the contamination source addresses the underlying cause.
38. C — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect hydraulic brake pedal feel. The other choices all directly cause hard pedal with reduced braking force: worn lining reduces friction, brake booster failure reduces pressure assist, and restricted hose reduces fluid flow.
39. A — Failed air-hydraulic actuator unable to develop proper hydraulic pressure during application. With proper air supply pressure verified, weak braking in an air-over-hydraulic system typically indicates failure in the air-hydraulic actuator that converts air pressure to hydraulic pressure. The

actuator may have internal seal failure, mechanical damage, or contamination preventing proper hydraulic pressure development.

40. D — Intermittent ABS function, then permanent ABS warning, then loss of ABS protection. Worn ABS wheel speed sensors progress through intermittent function (occasional warning lamp activation), then permanent warning (controller disables ABS function), then loss of ABS protection (no anti-lock function during emergency braking). Recognition of intermittent symptoms allows intervention before complete ABS protection loss.
41. C — Inspect for service-related damage, sensor air gap issues, or wiring damage during the recent work. Multiple ABS faults appearing after recent service typically trace to service-related issues: damaged sensor wiring, improper sensor air gap setting, or component damage during the service work. Investigation focuses on what changed during the recent service rather than blanket replacement.
42. A — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect ABS wheel speed sensor operation. The other choices all directly cause single-wheel ABS sensor faults: damaged tone ring, sensor wiring damage, and excessive air gap all affect signal quality at the affected wheel.
43. D — Rapid open-close cycling controlled by the ABS controller to modulate brake pressure. ABS modulator valves rapidly cycle open and closed during ABS-active braking, modulating brake pressure to prevent wheel lockup. The cycling occurs many times per second, allowing the wheel to slip enough for steering control while maintaining maximum braking force.
44. B — Investigate the underlying cause rather than continuing to clear without correction. ABS fault codes that return immediately after clearing indicate the underlying fault is still active. Continuing to clear without correction wastes service time and may mask conditions that need attention. The proper approach is to investigate why the fault is setting and correct the actual cause.
45. C — Restricted brake hose, contaminated lining, or seized caliper on the affected side. Brake pull during application indicates unequal braking force between the two sides, typically from one side delivering less force than the other. Restricted hoses, contaminated lining, or seized calipers all directly produce this asymmetric braking pattern at the affected side.
46. A — Inspect for failed brake hose with internal damage allowing expansion under pressure. A spongy pedal that does not improve after bleeding indicates a non-air source of pedal compliance. Brake hoses with internal damage can expand under pressure during application, producing the spongy feel that bleeding cannot eliminate. The damage is internal and not visible from external inspection.
47. D — A failed coolant temperature sensor reading falsely cold to the engine ECM. ECT sensor errors affect engine fuel mixture but do not affect hydraulic brake fluid moisture absorption. The

other choices all directly result from operating with moisture-saturated fluid: reduced boiling point, internal corrosion damage, and increased risk of vapor lock during heavy braking.

48. B — Flush the entire hydraulic brake system and refill with proper specification fluid. Hydraulic brake fluid contamination requires complete system flush with new fluid because contamination cannot be selectively removed. Adding more fluid dilutes but does not eliminate contamination; the contamination has reached all system components and requires complete fluid replacement.
49. C — Failed wheel speed sensor producing inconsistent signal during normal operation. ABS activation during normal light brake applications when no wheel slip is occurring indicates the controller is detecting incorrect data, typically from a failed wheel speed sensor producing inconsistent signals. The sensor failure causes the controller to incorrectly identify wheel slip and activate ABS unnecessarily.
50. B — Reduced boiling point, then brake fade, then internal corrosion, then component failure. Contaminated hydraulic brake fluid not replaced per service interval progresses through reduced boiling point (from moisture absorption), then brake fade (vapor lock during heavy braking), then internal corrosion (moisture and contaminants damage components), then component failure (corroded seals leak, corroded surfaces fail). Each stage progresses to the next without intervention.