PRACTICE EXAM 12: ASE T4 BRAKES SIMULATION

1. A heavy-truck air brake system experiences a 15 psi drop in supply reservoir pressure during a 60-second period with brakes released. The total system was at 120 psi at the start. Assuming the engine is off, this leakage rate of approximately 15 psi per minute is:

A. Normal for a stationary vehicle

B. Acceptable for a bobtail tractor only

C. Excessive — well above the 2 psi per minute limit for bobtails released

D. Indicative of a failed compressor

2. A driver complains that the brake pedal feels firm when applied immediately after starting the engine but becomes spongy after several stops in city traffic. The most likely root cause on a vacuum-boosted system is:

A. Reduced manifold vacuum from frequent stop-and-go driving depleting reserve in the booster

B. Air entering the hydraulic lines through normal use

C. Master cylinder return spring failure

D. Excessive caliper slide pin friction

3. A wheel speed sensor produces an output voltage that varies with wheel speed. The relationship is:

A. Inverse — higher speed produces lower voltage

B. Square root proportional

C. Logarithmic

D. Direct — higher rotational speed produces higher pulse frequency and amplitude

4. A heavy-truck driver's complaint is "brake pedal goes to the floor after several minutes of holding pressure." Visual inspection shows no fluid loss and the reservoir is full. The MOST likely cause is:

A. Failed master cylinder return spring

B. Internal master cylinder bypass past the primary or secondary piston seal

C. Air in the hydraulic lines

D. Worn caliper slide pins

5. The torque specification for typical heavy-truck wheel lug nuts on a steel hub is approximately:

A. 450 to 500 ft-lb (typical M22 stud size)

B. 200 to 250 ft-lb

C. 100 to 150 ft-lb

D. 800 to 900 ft-lb

6. A driver complains that the trailer brakes apply during a stop but release noticeably slower than the tractor brakes — taking approximately 2 seconds longer to release. This delay is MOST likely caused by:

A. Excessive driver pedal pressure

B. Normal trailer brake response variation

C. Restriction in the trailer service line preventing rapid air exhaust during release

D. Failed compressor on the tractor

7. The maximum diameter of a brake drum that has been machined past the discard limit:

A. Can be returned to service if friction performance tests are acceptable

B. Should be machined again to a smaller diameter

C. Should be reinforced with structural welding

D. Cannot be returned to service under any circumstances; the drum must be replaced

8. A heavy-truck air system shows that the air dryer's heater element draws 15 amps when energized. Using V=IR with a 12V system, the resistance of the heater element is approximately:

A. 1.5 ohms

B. 0.8 ohms

C. 25 ohms

D. 100 ohms

9. A driver reports the brake pedal feels normal during light braking but becomes noticeably softer during hard application. The vehicle has a vacuum brake booster. The MOST likely cause is:

A. Excessive booster diaphragm flex under high load — partial diaphragm failure

B. Failed master cylinder

C. Worn ABS modulator

D. Excessive caliper slide pin wear

10. A wheel bearing service interval is determined primarily by:

A. Driver preference

B. Calendar time only

C. Manufacturer specification — typically miles or hours of operation

D. Tire wear pattern

11. A heavy-truck S-cam brake's mechanical advantage is determined by:

A. The chamber's diaphragm material

B. The slack adjuster's effective lever arm length and the cam profile geometry

C. The compressor's pumping rate

D. The wheel bearing's preload

12. A heavy-truck driver is operating a tractor pulling two trailers (combination doubles). The tractor protection valve and red dash valve control:

A. Only the lead trailer

B. Only the second trailer

C. Both trailers individually with separate dash valves

D. Both trailers simultaneously through a single supply line system

13. A driver reports that the brake fluid reservoir level is dropping over a period of weeks with no visible external leak. The reservoir was full two weeks ago and is now near minimum. The MOST likely cause is:

A. Internal master cylinder leak past the primary or secondary piston seal causing fluid loss internally

B. Normal fluid evaporation

C. Excessive pedal application

D. ABS fluid consumption

14. A heavy-truck air compressor that is operating normally should NOT:

A. Cycle on and off based on system pressure

B. Build pressure from 85 to 100 psi within 45 seconds

C. Discharge oil into the air system through worn piston rings

D. Be lubricated by engine oil through a pressurized line

15. A driver's complaint is "brake pedal pulsation only on first application after parking overnight." The vehicle has front disc brakes. The MOST likely cause is:

A. Failed master cylinder

B. Surface rust on rotor friction surface that gets cleaned off by the first application — disappears after the first stop

C. Worn caliper slide pins

D. Failed wheel speed sensor

16. The federal regulation that requires disc brake rotors to be marked with minimum thickness specifications is found in:

A. FMVSS 105

B. FMVSS 121

C. FMVSS 106

D. FMVSS 135

17. A driver complains of brake pedal pulsation that occurs during all braking conditions, not just hard stops. The MOST likely cause is:

A. Rotor thickness variation that produces uniform pulsation regardless of speed or pedal pressure

B. ABS activation during normal braking

C. Master cylinder failure

D. Wheel bearing failure

18. A typical heavy-truck wheel speed sensor produces a signal output of approximately:

A. 12 volts DC continuous

B. 0.5 to 1.5 volts AC

C. Varying AC voltage proportional to wheel speed (typically 1 to 5 volts AC at highway speeds)

D. 24 volts DC pulsing

19. A heavy-truck air system that experiences a complete loss of pressure should result in:

A. Service brakes applying automatically

B. Spring brakes applying through the parking section power springs as a fail-safe

C. ABS warning lamp deactivation

D. Engine ECU shutdown

20. A heavy-truck brake compressor is operating at 1,800 RPM. Engine RPM is 1,800. This indicates:

A. The compressor is over-speeding

B. The compressor is under-speeding

C. The drive ratio is incorrect

D. The compressor is direct-coupled to the engine timing train (1:1 ratio)

21. A driver complains that when the trailer brakes apply, the trailer pulls hard to the left during stops. The MOST likely cause is:

A. Brake imbalance between trailer wheels — typically contaminated friction material on one wheel

B. Excessive trailer reservoir pressure

C. Failed tractor protection valve

D. Normal trailer behavior under load

22. A heavy-truck ABS warning lamp circuit is wired through:

A. The engine ECU only

B. The tractor's brake fluid level switch

C. The ABS ECU which monitors all sensors and actuators and illuminates the lamp upon fault detection

D. The wheel speed sensors directly

23. A driver complains of a vibration during braking from highway speed that does NOT occur at lower speeds. This pattern is consistent with:

A. Normal brake operation

B. Rotor thickness variation that produces vibration amplified at higher rotational speeds

C. ABS activation only at higher speeds

D. Tire pressure issues unrelated to brakes

24. The federal regulation requiring annual brake inspections is:

A. 49 CFR 393.1

B. 49 CFR 396.1

C. 49 CFR 380.12

D. 49 CFR 396.17

25. A heavy-truck air brake system is undergoing service. Before opening any air line connection, the technician should:

A. Drain all reservoirs to zero pressure

B. Apply the parking brake

C. Disconnect the battery

D. Remove all wheel lug nuts

26. A driver reports that the brake pedal is firm but the brakes are weak. After verifying air pressure is normal at all reservoirs, the technician should:

A. Replace the master cylinder

B. Replace the pedal linkage

C. Check brake adjustment at each wheel — out-of-adjustment brakes produce weak braking despite normal air pressure

D. Replace the compressor

27. The minimum wheel bearing pre-load specification on most heavy-truck applications is:

A. Maximum tightness with no clearance

B. Two complete rotations after final tightening

C. Hand-tight only

D. Specific to manufacturer — typically 0.001 to 0.005 inches of measurable endplay after adjustment

28. A heavy-truck brake hose that has been damaged by chassis abrasion shows visible wear at the contact point. The hose:

A. Can be reinforced with tape and continued in service

B. Must be replaced because abrasion damage compromises hose integrity

C. Can be repaired with a hose mender if the damage is small

D. Should be lubricated and continued in service

29. A heavy-truck driver complains of a "vibration in the steering wheel" only during braking from highway speed. The MOST likely cause is:

A. Front rotor thickness variation causing pulsation that is transmitted through the steering linkage to the steering wheel

B. Worn wheel bearings

C. Failed power steering pump

D. ABS modulator failure

30. The brake fluid level indicator on the master cylinder reservoir should be:

A. Always at the maximum mark

B. At the minimum mark for normal operation

C. Above the minimum mark and below the maximum mark

D. Within the normal operating range, between the minimum and maximum marks

31. A heavy-truck air dryer's purge valve is signaled to open by:

A. The treadle valve application

B. The driver's parking brake input

C. Air pressure delivered through a control line from the governor when the compressor unloads

D. The engine ECU

32. A driver complains of a hissing sound that occurs only during hard braking. The hissing stops when the pedal is released. The MOST likely cause is:

A. Air dryer purge cycle activating

B. Air leak at a chamber location during application — likely a torn diaphragm or cracked supply line

C. ABS modulator activation

D. Tire road noise

33. A heavy-truck wheel bearing replacement should always include:

A. Replacement of both the cup and cone as a matched set

B. Reuse of the original wheel seal

C. Reuse of the spindle nut

D. Reuse of the cotter pin

34. A driver reports that the trailer brakes have been "weak" for the past several weeks. After investigation, the technician finds the trailer reservoir is partially blocked by debris from a previous service. The recommended action is:

A. Remove only the visible debris and continue

B. Add a strainer to filter out future debris

C. Adjust the brake system to compensate

D. Drain the reservoir completely, flush with clean air, and inspect for additional contamination

35. A heavy-truck air system with worn compressor rings will:

A. Show a gradual increase in compressor cut-out pressure

B. Improve fuel economy

C. Produce oil contamination throughout the supply-side air system, including the dryer and reservoirs

D. Have no effect on system performance

36. A driver complains that the parking brake "drags" during normal driving — meaning the spring brakes are partially applied even though the dash valve is pushed in. The MOST likely cause is:

A. Excessive wheel bearing endplay

B. Insufficient air pressure reaching the spring chamber control ports — lines may be partially blocked or pressure marginal

C. Failed master cylinder

D. ABS modulator failure

37. The legal CVSA out-of-service criterion for hub oil/grease leakage is:

A. Any leakage that is dripping is grounds for OOS

B. Only leakage that affects vehicle operation

C. Leakage less than 25 drops per minute is acceptable

D. All leakage is acceptable as long as fluid is replaced

38. A heavy-truck air brake compressor that has been running continuously and producing pressure beyond cut-out should:

A. Be allowed to continue running

B. Have its drive belt removed

C. Be turned off until pressure drops

D. Be diagnosed immediately for governor failure — the safety relief valve should not be expected to handle continuous overload

39. A driver complains that the brakes feel "different" but cannot describe the change. All measurements are within specification. The technician should:

A. Replace the master cylinder

B. Replace all four calipers

C. Discuss observations with the driver, perform a road test to recreate the condition, and document findings for the next service interval

D. Recalibrate the ABS

40. A heavy-truck air system maintains a service reservoir pressure of 120 psi. If a single brake application uses 5 psi of reservoir pressure, the reservoir contains capacity for approximately how many full applications without compressor input (assuming 12× chamber displacement)?

A. 5 to 8 applications

B. Approximately 12 to 24 applications, depending on chamber size and pedal application strength

C. 50 applications

D. Only 1 application

41. The brake fluid in a hydraulic brake system should be changed at intervals specified by:

A. The vehicle manufacturer

B. The driver's preference

C. The fluid bottle's expiration date

D. The federal government

42. A heavy-truck driver operates a tractor with a single trailer. The trailer is equipped with a pup trailer (full trailer in tow). The tractor protection valve isolates:

A. Only the first trailer

B. Only the pup trailer

C. The trailers individually with separate dash valves

D. Both trailers simultaneously through the supply circuit

43. A heavy-truck wheel speed sensor that has corroded internal connections will produce:

A. Higher-than-normal output voltage

B. Continuous false ABS activation

C. Weak or intermittent signal output, producing ABS faults that may be intermittent or persistent

D. Activation of the parking brake

44. The standard rotor minimum thickness specification on a heavy-truck disc brake is typically:

A. Minimum thickness should always be greater than the original new specification

B. Stamped on the rotor itself or specified in the manufacturer's service manual

C. Determined by the technician's judgment

D. Can be calculated from the rotor's diameter

45. A driver complains that the trailer brakes apply normally on light pedal pressure but become weaker during firm braking. The MOST likely cause is:

A. Reduced trailer relay valve effectiveness under high signal pressure — possibly worn internals

B. Excessive system pressure

C. Failed master cylinder

D. ABS warning lamp circuit issue

46. The FMVSS 121 requirement for trailer ABS effectiveness applies to trailers manufactured after:

A. October 1990

B. January 1995

C. December 2001

D. March 1998

47. A heavy-truck air brake system uses a "blue gladhand" for what purpose?

A. Trailer supply (emergency) air

B. Trailer mud flaps connection

C. Trailer service signal air

D. Trailer ABS electrical connection

48. A driver complains of a "metallic clunking" sound from the rear of the vehicle during braking. The vehicle has rear drum brakes. The MOST likely cause is:

A. Wheel bearing failure

B. Worn brake hardware (return springs, hold-downs, anchor pins) — components are loose and contacting during application

C. Master cylinder failure

D. Compressor failure

49. A heavy-truck air brake system uses a relay valve at the rear axle. The relay valve's primary function is to:

A. Reduce brake application and release time at the rear chambers by sourcing air locally

B. Boost brake fluid pressure

C. Modulate ABS pressure

D. Regulate compressor output

50. A heavy-truck driver reports that the brakes have a "spongy" feel that has gradually worsened over several months on a hydraulic-braked Class 6 truck. The MOST likely root cause is:

A. Master cylinder failure

B. ABS fault

C. Air entering the hydraulic system through normal use — bleeding required

D. Internal flex hose deterioration that has gradually progressed — hoses should be inspected and replaced if internal damage is present

PRACTICE EXAM 12 — ANSWER KEY AND EXPLANATIONS

1. C — Excessive — well above the 2 psi per minute limit for bobtails released. CVSA criteria limit bobtail tractor leakage to 2 psi per minute with brakes released. A 15 psi loss per minute is roughly seven times this limit, indicating severe leakage that must be located and repaired immediately before the vehicle returns to service.

2. A — Reduced manifold vacuum from frequent stop-and-go driving depleting reserve in the booster. During frequent city stop-and-go, the engine's intake manifold vacuum is repeatedly drawn down by booster operation. The reserve vacuum in the booster cannot fully recover between applications, producing the progressive sponginess as the booster's stored vacuum is depleted.

3. D — Direct — higher rotational speed produces higher pulse frequency and amplitude. The wheel speed sensor produces an AC pulse signal each time a tone ring tooth passes the sensor tip. Higher rotational speed produces both higher pulse frequency (more pulses per second) and higher pulse amplitude (stronger signal), allowing the ECU to track wheel speed accurately across the operating range.

4. B — Internal master cylinder bypass past the primary or secondary piston seal. A pedal that goes to the floor under sustained pressure with no fluid loss is the distinctive fingerprint of internal piston seal bypass. Fluid moves past the worn seal within the cylinder under sustained pressure but no fluid is lost from the system — only the master cylinder repair or replacement resolves it.

5. A — 450 to 500 ft-lb (typical M22 stud size). Heavy-truck wheel lug nuts on M22 studs (the dominant standard for Class 7 and 8 trucks) typically require torque in the 450 to 500 ft-lb range. Proper torque ensures the wheel is securely clamped to the hub while preventing stud failure from over-torquing — always verify the specific manufacturer's torque value.

6. C — Restriction in the trailer service line preventing rapid air exhaust during release. Slow trailer release indicates restricted air flow during the exhaust phase. The restriction in the service line limits the rate at which the chamber air can return to the tractor's exhaust port, delaying the release. Fast application but slow release is the diagnostic fingerprint of an exhaust-side restriction.

7. D — Cannot be returned to service under any circumstances; the drum must be replaced. Once a brake drum has been machined to the discard limit, no further service is permitted under any condition. The drum has reached its end of structural and thermal capacity, and continued use risks catastrophic failure under load. Replacement is the only acceptable action.

8. B — 0.8 ohms. Using Ohm's Law (R = V/I), at 12 volts and 15 amps draw, the resistance calculates to 0.8 ohms. This range is typical of higher-current air dryer heater elements. Always verify the specific manufacturer's resistance specification when diagnosing.

9. A — Excessive booster diaphragm flex under high load — partial diaphragm failure. A booster diaphragm with a small tear or partial failure cannot maintain the pressure differential needed under high load. Light braking is unaffected because lower force is required, but firm application reveals the diaphragm's reduced ability to develop full assist force.

10. C — Manufacturer specification — typically miles or hours of operation. Wheel bearing service intervals are determined by the vehicle manufacturer based on hub design, lubricant type, and operational conditions. Modern sealed designs often go 100,000+ miles between services. Always follow the manufacturer's specified interval.

11. B — The slack adjuster's effective lever arm length and the cam profile geometry. The S-cam brake's mechanical advantage is determined by the slack adjuster's lever arm length (which converts pushrod force to camshaft torque) and the S-cam's profile geometry (which converts camshaft rotation to shoe spread force). Both factors combine to produce the designed braking torque output.

12. D — Both trailers simultaneously through a single supply line system. The tractor protection valve and red dash valve control all trailer connections through a single supply system. Combination doubles share the same supply line system, with both trailers affected simultaneously when the dash valve is operated.

13. A — Internal master cylinder leak past the primary or secondary piston seal causing fluid loss internally. Gradual reservoir depletion without visible external leakage points to internal master cylinder leakage past worn piston seals. The fluid moves past the worn seals internally — eventually the reservoir fills the void created by this internal leak, producing the gradual depletion symptom.

14. C — Discharge oil into the air system through worn piston rings. A normally operating compressor should not discharge oil into the air system. Oil contamination in the supply-side components is a definite signature of compressor wear (piston ring failure) — the compressor must be repaired or replaced before oil contamination spreads further downstream.

15. B — Surface rust on rotor friction surface that gets cleaned off by the first application — disappears after the first stop. Light surface rust forms on rotor friction surfaces during overnight parking. The first brake application after starting produces pedal pulsation as the rust is mechanically removed by the pads. The pulsation disappears after one or two applications — this is normal and harmless.

16. D — FMVSS 135. FMVSS 135 specifies the construction and marking requirements for hydraulic brake disc rotors, including minimum thickness specifications that must be marked on the rotor

itself. The other FMVSS standards address other aspects of the brake system but not specifically rotor markings.

17. A — Rotor thickness variation that produces uniform pulsation regardless of speed or pedal pressure. When pedal pulsation occurs during all braking conditions (not just hard stops or highway speeds), the cause is rotor thickness variation. The variation is mechanical and consistent — it produces the same pulsation at all braking conditions because it's not amplified by speed or pressure.

18. C — Varying AC voltage proportional to wheel speed (typically 1 to 5 volts AC at highway speeds). Wheel speed sensors produce AC voltage output proportional to wheel rotational speed. At highway speeds, output is typically in the 1 to 5 volt AC range. The ECU converts this AC signal to digital wheel speed data for ABS calculations.

19. B — Spring brakes applying through the parking section power springs as a fail-safe. Loss of all air pressure causes the spring brake chambers to apply the parking brake mechanically through the power springs. This fail-safe function ensures that a parked truck cannot roll even if all air pressure is lost — a critical safety feature mandated by FMVSS 121.

20. D — The compressor is direct-coupled to the engine timing train (1:1 ratio). When compressor RPM equals engine RPM, the compressor is direct-coupled to the engine timing train through gear drive. The 1:1 ratio is standard for many heavy-truck applications and provides reliable compressor operation at all engine speeds.

21. A — Brake imbalance between trailer wheels — typically contaminated friction material on one wheel. Trailer pull during braking indicates one trailer brake is doing more or less work than the others. The most common cause is contaminated friction material on one wheel — the contamination reduces friction coefficient and shifts the balance of braking force, causing the trailer to pull toward the side with stronger braking.

22. C — The ABS ECU which monitors all sensors and actuators and illuminates the lamp upon fault detection. The ABS warning lamp is controlled by the ABS ECU, which monitors all wheel speed sensors and modulator solenoids continuously. When a fault is detected, the ECU illuminates the warning lamp through the lamp circuit — a key indicator that the ABS system has identified a problem.

23. B — Rotor thickness variation that produces vibration amplified at higher rotational speeds. Vibration during braking that occurs only at highway speed (not lower speeds) is amplified rotor thickness variation. The variation creates an alternating clamping force at the rotor's rotational frequency — at higher rotational speeds, the alternating frequency is higher and produces stronger vibration.

24. D — 49 CFR 396.17. The federal regulation that requires annual brake inspections is 49 CFR 396.17. This regulation specifies that all commercial motor vehicles must undergo annual

inspections that include brake adjustment measurements, leak testing, and component condition assessments. The inspection report must be retained as required.

25. A — Drain all reservoirs to zero pressure. Before opening any air line connection, all reservoirs must be drained to zero pressure to prevent injury from pressurized air release. Air pressure can launch components forcefully when fittings are loosened, and zero-pressure draining is the only safe condition for line service.

26. C — Check brake adjustment at each wheel — out-of-adjustment brakes produce weak braking despite normal air pressure. Out-of-adjustment brakes produce weak braking even with normal air pressure delivered to the chambers. The reduced mechanical advantage at the slack adjuster means the chamber force is not converted efficiently to braking torque. Brake adjustment verification is a fundamental diagnostic step for "weak brakes" complaints.

27. D — Specific to manufacturer — typically 0.001 to 0.005 inches of measurable endplay after adjustment. The standard endplay specification for commercial vehicle wheel bearings is 0.001 to 0.005 inches measured with a dial indicator. This small clearance ensures the bearings are properly seated without being over-preloaded — which would generate heat and accelerate failure.

28. B — Must be replaced because abrasion damage compromises hose integrity. Abrasion damage to a brake hose compromises its ability to contain pressure safely. The reinforcement layers may be damaged even if the outer cover appears intact, and continued use risks catastrophic hose failure under pressure. Hose replacement is the only acceptable repair for abrasion damage.

29. A — Front rotor thickness variation causing pulsation that is transmitted through the steering linkage to the steering wheel. Front rotor thickness variation produces pulsation at each wheel that is transmitted through the steering knuckle and steering linkage to the steering wheel. The pulsation is felt as steering wheel vibration during braking — the distinctive diagnostic fingerprint pointing to front rotor issues.

30. D — Within the normal operating range, between the minimum and maximum marks. Brake fluid level should be maintained within the normal operating range marked on the reservoir. The maximum mark accommodates fluid expansion at high temperatures, while the minimum mark ensures adequate fluid for the master cylinder to function. Fluid below minimum is a serious concern indicating either leakage or excessive consumption.

31. C — Air pressure delivered through a control line from the governor when the compressor unloads. The air dryer purge valve is signaled to open by air pressure from the governor's unload signal. When the governor commands the compressor to unload at cut-out, the same control air opens the purge valve, allowing the desiccant to regenerate by purging accumulated moisture and contamination.

32. B — Air leak at a chamber location during application — likely a torn diaphragm or cracked supply line. Hissing during hard braking that stops on release is the diagnostic fingerprint of a chamber-

related leak that opens up under high pressure. Possible causes include a torn chamber diaphragm or a cracked air supply line that leaks only under application pressure.

33. A — Replacement of both the cup and cone as a matched set. Wheel bearings must always be replaced as cup-and-cone matched sets. Running a new component against a worn surface produces accelerated wear that fails the new component prematurely. Both halves of the bearing pair must be installed together for proper service life.

34. D — Drain the reservoir completely, flush with clean air, and inspect for additional contamination. Debris in the trailer reservoir indicates a contamination issue that must be fully addressed. Draining the reservoir, flushing with clean air, and inspecting downstream components for additional contamination ensures the entire trailer system is restored to clean operating condition.

35. C — Produce oil contamination throughout the supply-side air system, including the dryer and reservoirs. Worn compressor rings allow oil to bypass into the discharge air stream. The oil carries downstream and contaminates the air dryer (saturating the desiccant), the reservoirs, and ultimately the entire supply-side system — a definitive diagnostic for compressor wear.

36. B — Insufficient air pressure reaching the spring chamber control ports — lines may be partially blocked or pressure marginal. Parking brake "drag" (partial application) indicates the spring chambers are not receiving adequate control air to fully release the power springs. Lines may be partially blocked, system pressure may be marginal, or there may be an upstream restriction reducing the pressure delivered to the chambers.

37. A — Any leakage that is dripping is grounds for OOS. Under CVSA criteria, any hub oil or grease leakage that is actually dripping (not just film or sweating) is grounds for out-of-service status. This stricter standard reflects the safety significance of bearing lubrication — leaking lubricant reduces bearing life and can lead to wheel-end failure.

38. D — Be diagnosed immediately for governor failure — the safety relief valve should not be expected to handle continuous overload. When system pressure exceeds cut-out and the compressor continues running, the governor has failed. The safety relief valve is intended for emergency overpressure protection, not continuous operation — relying on it as the only protection is unacceptable. The governor must be diagnosed and repaired immediately.

39. C — Discuss observations with the driver, perform a road test to recreate the condition, and document findings for the next service interval. Vague complaints with no measurable findings should not result in unnecessary parts replacement. The technician should discuss observations with the driver, perform a road test to verify and characterize the condition, and document findings clearly. Monitoring at the next interval allows early detection if the symptom develops further.

40. B — Approximately 12 to 24 applications, depending on chamber size and pedal application strength. FMVSS 121's 12× chamber displacement requirement provides reserve capacity for approximately 12 to 24 full-pressure brake applications without compressor input, depending on

application strength and chamber size. This reserve capacity is essential for safe operation if the compressor fails during operation.

41. A — The vehicle manufacturer. Brake fluid replacement intervals are specified by the vehicle manufacturer and should be documented in the service information. Following the manufacturer's interval ensures the fluid maintains adequate boiling point and corrosion protection throughout its service life. Generic intervals are not appropriate replacements for manufacturer specifications.

42. D — Both trailers simultaneously through the supply circuit. The tractor protection valve isolates the entire trailer supply circuit, including all trailers in a combination. There are no separate dash valves for individual trailers in standard configurations — the entire trailer supply system is controlled by a single TPV through the red dash valve.

43. C — Weak or intermittent signal output, producing ABS faults that may be intermittent or persistent. Corroded internal connections in a wheel speed sensor weaken the electrical signal output. Depending on the corrosion severity, the symptom may be intermittent ABS faults (when corrosion makes intermittent connections) or persistent faults (when connections are completely interrupted). The sensor must typically be replaced.

44. B — Stamped on the rotor itself or specified in the manufacturer's service manual. Minimum rotor thickness specifications are marked on the rotor itself for field reference, with the manufacturer's service manual providing the authoritative specification. Always verify the actual rotor thickness against the marked or published specification before machining or returning to service.

45. A — Reduced trailer relay valve effectiveness under high signal pressure — possibly worn internals. A trailer relay valve that delivers normal pressure under light signal but reduced pressure under high signal is exhibiting internal wear. The valve cannot maintain the proper amplification ratio across the full pressure range, producing weak braking specifically during firm applications when high pressure is needed.

46. D — March 1998. FMVSS 121's ABS requirement for trailers became effective March 1, 1998. Trailers manufactured before this date are exempt from the ABS requirement, though many fleet operators voluntarily retrofit older equipment for safety. Trailers manufactured on or after this date must include functional ABS to meet the standard.

47. C — Trailer service signal air. The blue gladhand on a heavy-truck tractor carries the service signal air to the trailer. This signal commands the trailer's relay emergency valve to apply the trailer brakes. The blue gladhand is paired with the red gladhand (supply air), and federal standardization ensures color coding is consistent across all heavy-truck applications.

48. B — Worn brake hardware (return springs, hold-downs, anchor pins) — components are loose and contacting during application. A "metallic clunking" sound from rear drum brakes during braking is the distinctive fingerprint of worn brake hardware. Loose components contact each other during

the application, producing the characteristic clunking sound. Hardware should be inspected and replaced as needed during shoe service.

49. A — Reduce brake application and release time at the rear chambers by sourcing air locally. The relay valve mounted near the rear axle sources delivery air from a nearby reservoir, responding to a small-volume pilot signal from the treadle valve. This eliminates the long fill path from the cab and dramatically reduces both application and release times at the rear chambers — critical for safety on long-wheelbase tractors.

50. D — Internal flex hose deterioration that has gradually progressed — hoses should be inspected and replaced if internal damage is present. Gradual sponginess on a hydraulic-braked vehicle that has not had recent service typically points to flex hose internal deterioration. The hoses lose their internal reinforcement progressively, producing increasing compliance under pressure. Hose inspection and replacement is the recommended diagnostic and repair path.