PRACTICE EXAM 19: ASE T4 BRAKES SIMULATION

1. The brake compressor is signaled to load when system pressure drops to:

A. The cut-in threshold (typically 100 to 110 psi)

B. 60 psi

C. 80 psi

D. 200 psi

2. A heavy-truck driver complains of brake pedal pulsation only at highway speed. The MOST likely cause is:

A. Failed master cylinder

B. Worn caliper slide pins

C. Front rotor thickness variation amplified at higher speeds

D. Failed wheel speed sensor

3. The trailer's relay emergency valve activates the emergency function when:

A. The driver applies the foot brake

B. Supply air pressure drops below the threshold

C. The ABS modulator activates

D. The compressor cycles on

4. The brake fluid type used in most heavy-truck hydraulic systems is:

A. SAE 5W-30 motor oil

B. DOT 1 mineral oil

C. DOT 5 silicone-based fluid

D. DOT 3 or DOT 4 glycol-based fluid

5. A heavy-truck wheel bearing service interval is determined by:

A. Manufacturer specification based on miles or hours

B. Driver preference

C. Calendar time only

D. Tire wear pattern

6. The brake camshaft on an S-cam foundation brake is rotated by:

A. The chamber diaphragm directly

B. The wheel speed sensor

C. The slack adjuster

D. The compressor

7. A heavy-truck air dryer's purge valve receives its signal from:

A. The driver's pedal

B. The governor's unload signal

C. The ABS modulator

D. The trailer connection

8. The brake compressor on a heavy-truck rotates whenever:

A. The driver applies the brake pedal

B. The trailer is connected

C. The ABS is active

D. The engine is running

9. A heavy-truck wheel bearing endplay specification after final adjustment is typically:

A. 0.001 to 0.005 inches

B. 0.020 to 0.040 inches

C. 0.060 to 0.080 inches

D. Maximum tightness with no clearance

10. The brake fluid reservoir cap allows:

A. Heating in cold weather

B. Pressurization above atmospheric

C. Atmospheric pressure equalization while excluding contamination

D. Magnetic separation of debris

11. The brake compressor on a heavy-truck is driven by:

A. A belt from the alternator

B. A gear from the engine timing train

C. Hydraulic pressure from the power steering pump

D. An electric motor

12. A heavy-truck driver complains of a "metallic squeal" from the front brakes during light braking. The MOST likely cause is:

A. Failed wheel bearings

B. Master cylinder failure

C. Compressor failure

D. Worn brake pad wear indicator contacting the rotor

13. The brake camshaft is supported by:

A. The brake spider or a dedicated camshaft bracket

B. The wheel bearing housing

C. The chamber mounting bracket

D. The ABS modulator

14. A heavy-truck wheel speed sensor with corroded internal connections produces:

A. Stronger signal output

B. Improved ABS function

C. Weak or intermittent signal output

D. Activation of the parking brake

15. The brake compressor on a Class 8 tractor receives lubrication from:

A. A dedicated compressor oil reservoir

B. The engine's pressurized oil supply

C. Splash lubrication only

D. Fuel oil mixed with the air supply

16. A heavy-truck driver complains that the brake pedal feels "spongy" only after parking overnight. The MOST likely cause is:

A. Internal flex hose delamination becoming more pronounced when fluid is cold

B. Failed master cylinder

C. Worn brake pads

D. Failed compressor

17. The brake camshaft typically rotates approximately how many degrees during a full brake application?

A. 30 degrees

B. 180 degrees

C. 270 degrees

D. 75 to 90 degrees

18. The brake fluid level in the master cylinder reservoir should be:

A. Always at the maximum mark

B. At the minimum mark

C. Within the normal operating range

D. Below the minimum mark

19. The brake compressor is signaled to unload at:

A. The driver's pedal application

B. The cut-out pressure threshold

C. The trailer connection event

D. The ABS modulator activation

20. A heavy-truck wheel bearing must be replaced as:

A. A matched cup-and-cone set

B. Cones only

C. Cups only

D. Individual components

21. The brake fluid moisture content threshold for replacement is approximately:

A. 1%

B. 5%

C. 10%

D. 3%

22. The brake compressor on a heavy-truck typically has a displacement of:

A. 3 to 5 CFM at 1,250 RPM

B. 13 to 18 CFM at 1,250 RPM

C. 50 to 60 CFM at 1,250 RPM

D. 150 to 200 CFM at 1,250 RPM

23. A heavy-truck driver complains that the parking brake "drags" during normal driving. The MOST likely cause is:

A. Failed wheel bearings

B. Failed master cylinder

C. Insufficient air pressure reaching the spring chamber control ports

D. ABS modulator failure

24. The brake fluid bleeding sequence begins at:

A. The wheel farthest from the master cylinder

B. The wheel closest to the master cylinder

C. The wheel with the longest flex hose

D. All four wheels simultaneously

25. The brake fluid in a hydraulic system is essentially:

A. Highly compressible

B. Non-conductive

C. Magnetic

D. Incompressible, allowing pressure to transmit equally per Pascal's Law

26. A heavy-truck wheel speed sensor produces what type of signal?

A. DC voltage steady output

B. AC pulse signal proportional to wheel speed

C. PWM digital signal

D. 4-20 mA analog signal

27. The brake fluid reservoir cap typically includes:

A. A heating element

B. A magnetic separator

C. A vent that allows atmospheric pressure equalization

D. A pressure relief valve

28. The trailer's relay emergency valve performs how many primary functions simultaneously?

A. Three: service relay, reservoir charging, emergency application

B. One: service relay only

C. Four: service, parking, ABS, supply

D. Two: service and parking

29. A heavy-truck driver complains of a "groaning" sound from the front brakes only on the first application after parking overnight. The MOST likely cause is:

A. Failed wheel bearings

B. Worn brake pads

C. ABS modulator failure

D. Surface rust on the rotor friction surface that gets cleaned off

30. The brake camshaft on an S-cam foundation brake is typically supported in:

A. The wheel bearing housing

B. The brake spider with bushings

C. The chamber mounting bracket only

D. The ABS modulator

31. The brake compressor's drive method is preferred to be gear drive over belt drive because:

A. Gear drive is less expensive

B. Gear drive produces less heat

C. Gear drive eliminates slippage and provides reliable torque transmission

D. Gear drive enables compressor disengagement

32. The trailer's spring brake chambers apply when:

A. Control air pressure to the chambers drops below the release threshold

B. The driver applies the foot pedal

C. The ABS activates

D. The compressor cycles on

33. The brake fluid type used in a vehicle should match:

A. The supplier's recommendation

B. The driver's preference

C. Whatever fluid is currently in stock

D. The manufacturer's specification on the reservoir cap and service manual

34. A heavy-truck wheel bearing pre-load adjustment that produces excessive tightness will:

A. Improve bearing service life

B. Generate excessive heat and lead to lubricant breakdown

C. Reduce noise during operation

D. Improve braking performance

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

A. Always at the maximum mark

B. At the minimum mark

C. Within the normal operating range

D. Below the minimum mark

36. A heavy-truck driver complains that the brake pedal feels normal during the first stop but progressively softer with each subsequent stop. The MOST likely cause is:

A. Air entering the hydraulic system through normal use

B. Failed master cylinder

C. Worn brake pads

D. Failed wheel bearings

37. The brake fluid moisture content can be measured using:

A. A multimeter set to ohms

B. A pH test strip

C. A tire pressure gauge

D. An electronic brake fluid moisture tester

38. The brake camshaft on an S-cam foundation brake is connected to:

A. The chamber pushrod directly

B. The slack adjuster

C. The ABS modulator

D. The wheel speed sensor

39. The brake fluid reservoir cap should:

A. Be removed during cold weather

B. Be sealed completely without venting

C. Allow atmospheric pressure equalization while excluding contamination

D. Include a heating element

40. A heavy-truck wheel bearing is typically:

A. A tapered roller bearing

B. A ball bearing

C. A cylindrical roller bearing

D. A plain bushing

41. The brake fluid bleeding procedure requires:

A. Allowing the master cylinder reservoir to run dry between wheels

B. Capping the reservoir tightly during bleeding

C. Filling the reservoir with DOT 5 fluid

D. Keeping the master cylinder reservoir topped up throughout

42. A heavy-truck driver complains of a "metallic clunking" sound from the rear drum brakes during braking. The MOST likely cause is:

A. Failed wheel bearings

B. Worn brake hardware (return springs, hold-downs, anchor pins)

C. ABS modulator failure

D. Compressor failure

43. The brake fluid in a hydraulic system flows in which order?

A. From caliper through master cylinder

B. From wheel back to reservoir

C. From reservoir, through master cylinder, through lines, to wheel cylinders or calipers

D. From compressor to wheel

44. The brake fluid type specified on the master cylinder reservoir cap is determined by:

A. The vehicle manufacturer

B. The supplier

C. The driver

D. Whatever is in stock

45. A heavy-truck driver complains that the trailer brakes apply during stops but release noticeably slower than the tractor brakes. The MOST likely cause is:

A. Failed compressor

B. Excessive driver pedal pressure

C. Worn brake shoes

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

46. The brake compressor on a heavy-truck is signaled to load when:

A. System pressure rises above cut-out

B. System pressure drops to the cut-in threshold

C. The driver applies the brake pedal

D. The trailer is connected

47. A heavy-truck wheel speed sensor with excessive air gap will produce:

A. Stronger signal output

B. Improved ABS function

C. Weak or no signal output

D. Activation of the parking brake

48. The brake compressor's safety relief valve typically opens at:

A. 150 to 175 psi

B. 80 to 100 psi

C. 60 psi

D. 250 to 300 psi

49. The brake fluid reservoir level that drops with no visible external leak indicates:

A. Normal fluid evaporation

B. Excessive pedal application

C. Brake fluid being consumed by the ABS ECU

D. Internal master cylinder leak past the piston seals

50. The brake fluid type used in a vehicle should be determined by:

A. The driver's preference

B. The supplier's recommendation only

C. Whatever fluid is currently in stock

D. The reservoir cap labeling and the manufacturer's service information

PRACTICE EXAM 19 — ANSWER KEY AND EXPLANATIONS

1. A — The cut-in threshold (typically 100 to 110 psi). The compressor is signaled to load when system pressure drops to the cut-in threshold (typically 100 to 110 psi for systems with 120-135 psi cut-out). The governor sends the load signal to the compressor's unloader valve, which closes the inlet valves so the compressor begins compressing air again.

2. C — Front rotor thickness variation amplified at higher speeds. Pulsation that occurs only at highway speed but not at lower speeds points to rotor thickness variation. The variation amplifies the pulsation at higher rotational speeds because the alternating clamping force occurs at higher frequency.

3. B — Supply air pressure drops below the threshold. The trailer's relay emergency valve automatically activates the emergency function when supply air pressure drops below the threshold. The valve diverts reservoir air to apply the chambers, ensuring the trailer brakes apply if the supply line is severed or the tractor is disconnected.

4. D — DOT 3 or DOT 4 glycol-based fluid. Most heavy-truck hydraulic brake systems specify DOT 3 or DOT 4 glycol-based brake fluid. These fluids are hygroscopic, must be kept sealed, and must be replaced periodically as moisture absorption lowers their boiling point.

5. A — Manufacturer specification based on miles or hours. Wheel bearing service intervals are determined by the vehicle manufacturer based on hub design (sealed/oil-bath vs. grease) and operating conditions. Modern sealed designs often go 100,000 to 250,000 miles between services. Always follow the manufacturer's specified interval.

6. C — The slack adjuster. The brake camshaft on an S-cam foundation brake is rotated by the slack adjuster, which converts the linear pushrod force from the chamber into rotational force at the camshaft. The slack adjuster's lever arm length determines the mechanical advantage of this conversion.

7. B — The governor's unload signal. The air dryer's 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 signal opens the purge valve, allowing the desiccant to regenerate using stored dry air.

8. D — The engine is running. The compressor rotates whenever the engine is running because it is gear-driven and cannot be disengaged. When the system reaches cut-out pressure, the compressor

unloads internally — the unloader holds the inlet valves open so the compressor rotates without producing air.

9. A — 0.001 to 0.005 inches. The standard endplay specification for most commercial vehicle wheel bearings after final adjustment is 0.001 to 0.005 inches. This small clearance must be measured with a dial indicator and ensures proper bearing operation without overheating.

10. C — Atmospheric pressure equalization while excluding contamination. The brake fluid reservoir cap contains a one-way vent that allows atmospheric pressure equalization as fluid level changes (during braking and from temperature changes) while excluding moisture and dirt contamination.

11. B — A gear from the engine timing train. Heavy-truck air compressors are gear-driven from the engine timing train. This drive method eliminates belt slippage, handles high torque loads reliably, and aligns the compressor with the engine's shared lubrication and coolant systems.

12. D — Worn brake pad wear indicator contacting the rotor. The metallic squeal during light braking that disappears under firm pressure is the distinctive signature of a brake pad wear indicator contacting the rotor. The indicator is designed to alert the driver that pad replacement is needed before metal-to-rotor contact occurs.

13. A — The brake spider or a dedicated camshaft bracket. The brake camshaft runs across the axle and is supported in camshaft bushings installed in the brake spider or in a dedicated camshaft bracket bolted to the axle housing. Wear in these bushings allows camshaft deflection during brake application.

14. C — Weak or intermittent signal output. 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 or persistent faults. The sensor must typically be replaced.

15. B — The engine's pressurized oil supply. Heavy-truck air compressors share the engine's pressurized oil supply through an external oil line. This integration ensures consistent lubrication during operation and eliminates the need for a separate compressor lubrication system.

16. A — Internal flex hose delamination becoming more pronounced when fluid is cold. Cold-stiff hose with internal delamination produces increased compliance (sponginess) when fluid is cold. As fluid warms during operation, the hose conforms differently and pedal feel returns to normal. This temperature-correlated symptom is the distinctive fingerprint of progressing flex hose deterioration.

17. D — 75 to 90 degrees. The brake camshaft typically rotates approximately 75 to 90 degrees during a full brake application, depending on chamber type and the slack adjuster's lever arm length. Greater rotation produces greater shoe spread and braking torque.

18. C — Within the normal operating range. 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.

19. B — The cut-out pressure threshold. The compressor is signaled to unload when the governor detects system pressure has reached the cut-out threshold (typically 120 to 135 psi). The governor sends a control air signal to the compressor's unloader valve, which holds the inlet valves open so the compressor rotates without compressing air.

20. A — A matched cup-and-cone 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.

21. D — 3%. The industry standard for brake fluid replacement is when moisture content exceeds approximately 3%. Above this threshold, the wet boiling point drops significantly, increasing the risk of brake fade under hard braking. Periodic moisture testing and replacement is essential maintenance.

22. B — 13 to 18 CFM at 1,250 RPM. Typical Class 8 tractor air compressors have a displacement of 13 to 18 cubic feet per minute at 1,250 RPM. This range provides adequate reserve capacity to meet FMVSS 121 buildup time requirements while supporting normal in-service demand.

23. C — Insufficient air pressure reaching the spring chamber control ports. 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.

24. A — The wheel farthest from the master cylinder. The standard bleeding sequence works from the wheel farthest from the master cylinder toward the nearest wheel. This ensures air trapped in the longest line is purged first and minimizes the chance of reintroducing air into already-bled sections.

25. D — Incompressible, allowing pressure to transmit equally per Pascal's Law. Brake fluid is essentially incompressible, allowing pressure applied at the master cylinder to transmit equally throughout the system per Pascal's Law. This near-incompressibility is exactly why hydraulic brakes function — it transmits pedal effort efficiently to the wheel ends.

26. B — AC pulse signal proportional to wheel speed. Wheel speed sensors are magnetic devices that generate AC pulse signals each time a tone ring tooth passes the sensor tip. The pulse frequency and amplitude are both proportional to wheel rotational speed.

27. C — A vent that allows atmospheric pressure equalization. The brake fluid reservoir cap includes a one-way vent that allows atmospheric pressure equalization as fluid level changes while excluding moisture and dirt contamination. Tight sealing prevents the hygroscopic fluid from absorbing excess moisture.

28. A — Three: service relay, reservoir charging, emergency application. The trailer relay emergency valve performs three simultaneous functions: amplifying the service signal from the tractor for fast trailer brake response, charging the trailer reservoir from supply air, and automatically applying the trailer brakes from reservoir air during supply pressure loss.

29. D — Surface rust on the rotor friction surface that gets cleaned off. Light surface rust forms on rotor friction surfaces during overnight parking. The first brake application after starting produces a "groaning" sound as the rust is mechanically cleaned from the surface. The sound disappears as rotor surfaces normalize — a normal, harmless symptom.

30. B — The brake spider with bushings. The brake camshaft runs across the axle and is supported in camshaft bushings installed in the brake spider. Wear in these bushings allows camshaft deflection during brake application and produces a distinctive clunking sound and uneven shoe spread.

31. C — Gear drive eliminates slippage and provides reliable torque transmission. Gear drive is preferred over belt drive because it eliminates the slippage that occurs under heavy compressor torque loads. It also provides reliable, consistent torque transmission and integrates the compressor with the engine's lubrication and cooling systems.

32. A — Control air pressure to the chambers drops below the release threshold. The trailer's spring brake chambers apply when control air pressure to the chambers drops below the release threshold. The power spring inside each chamber requires approximately 60 to 70 psi of control air to overcome its preload and keep the brake released.

33. D — The manufacturer's specification on the reservoir cap and service manual. Brake fluid type is determined by the vehicle manufacturer's specifications — the reservoir cap is marked with the required type, and the service information confirms it. Mixing fluid types or using the wrong specification can damage seals and components.

34. B — Generate excessive heat and lead to lubricant breakdown. Excessive bearing pre-load produces continuous friction at the contact surfaces. Heat generated by this friction breaks down the lubricant, accelerates wear, and eventually causes bearing seizure. Proper endplay adjustment is essential to avoid this failure mode.

35. C — Within the normal operating range. 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.

36. A — Air entering the hydraulic system through normal use. A pedal that becomes progressively softer with each subsequent stop indicates air being pushed forward in the hydraulic system, redistributing through the lines. This is the classic symptom of air in the hydraulic system, requiring proper bleeding to remove the trapped air.

37. D — An electronic brake fluid moisture tester. Modern brake fluid moisture testers use electrochemical sensors to measure water content directly. These provide accurate, repeatable readings that guide the technician's decision on fluid replacement timing — typically when moisture exceeds 3%.

38. B — The slack adjuster. The brake camshaft is mechanically connected to the slack adjuster, which translates the linear pushrod force from the chamber into rotational force at the camshaft. The slack adjuster's lever arm length determines the mechanical advantage of this conversion.

39. C — Allow atmospheric pressure equalization while excluding contamination. The brake fluid reservoir cap allows atmospheric pressure equalization as fluid level changes during braking and from temperature changes, while excluding moisture and dirt contamination. Tight sealing prevents the hygroscopic fluid from absorbing excess moisture.

40. A — A tapered roller bearing. Heavy-truck wheel bearings are tapered roller bearings, designed to handle both radial and axial loads at the wheel end. The tapered geometry allows the bearing to carry thrust loads in one direction, with two opposing bearings providing thrust capability in both directions.

41. D — Keeping the master cylinder reservoir topped up throughout. The master cylinder reservoir must be kept topped up throughout the bleeding procedure. If the reservoir runs dry, air enters the master cylinder through the compensation ports and must then be purged out through the wheel cylinders, restarting the entire procedure.

42. B — Worn brake hardware (return springs, hold-downs, anchor pins). 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.

43. C — From reservoir, through master cylinder, through lines, to wheel cylinders or calipers. Brake fluid flows from the reservoir into the master cylinder, where it is pressurized when the driver applies the pedal. The pressurized fluid flows through the brake lines to the wheel cylinders or calipers, generating the braking force at each wheel.

44. A — The vehicle manufacturer. Brake fluid type is determined by the vehicle manufacturer's specifications, which are marked on the reservoir cap and confirmed in the service information. The manufacturer engineered the system for a specific fluid type — using anything else can damage seals and components.

45. D — 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.

46. B — System pressure drops to the cut-in threshold. The compressor is signaled to load when system pressure drops to the cut-in threshold (typically 100 to 110 psi). The governor sends the

load signal to the compressor's unloader valve, which closes the inlet valves so the compressor begins compressing air again.

47. C — Weak or no signal output. Excessive air gap between sensor and tone ring weakens the magnetic coupling, reducing the electrical pulse signal. The weakened signal can be insufficient for the ABS ECU to process correctly, producing a fault code and lamp illumination.

48. A — 150 to 175 psi. Heavy-truck air brake safety relief valves are typically set to open at approximately 150 to 175 psi. This pressure threshold is well above normal operating ranges (120-135 psi cut-out) but below the failure threshold of system components, providing safety protection.

49. D — Internal master cylinder leak past the piston seals. 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.

50. D — The reservoir cap labeling and the manufacturer's service information. Brake fluid type is determined by the vehicle manufacturer's specifications — the reservoir cap is marked with the required type, and the service manual confirms it. Mixing fluid types or using the wrong specification can damage seals and components throughout the system.