PRACTICE EXAM 17: ASE T4 BRAKES SIMULATION

1. The driver's primary input device for service brake application is the:

A. Yellow dash valve

B. Treadle valve

C. Red dash valve

D. Quick release valve

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

A. DC voltage steady output

B. PWM digital signal

C. AC pulse signal proportional to wheel speed

D. Analog 4-20 mA signal

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

A. DOT 5 silicone-based fluid

B. DOT 1 mineral oil

C. SAE 5W-30 motor oil

D. DOT 3 or DOT 4 glycol-based fluid

4. A heavy-truck disc brake caliper's slide pins should be lubricated with:

A. Approved silicone-based brake grease

B. Engine oil

C. Wheel bearing grease

D. White lithium grease

5. The compressor on a heavy-truck is signaled to unload at:

A. The driver's pedal application

B. The ABS modulator activation

C. Cut-out pressure (typically 120 to 135 psi) by the governor

D. The trailer connection event

6. A heavy-truck wheel bearing is typically a:

A. Ball bearing

B. Tapered roller bearing

C. Cylindrical roller bearing

D. Plain bushing

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

A. The slack adjuster

B. The chamber diaphragm directly

C. The wheel speed sensor

D. The compressor

8. A heavy-truck brake drum's friction surface should be:

A. Machined every PM interval regardless of condition

B. Discarded when any wear is detected

C. Allowed to develop a heat-discolored surface

D. Inspected for scoring, heat damage, and dimensional integrity

9. The trailer relay emergency valve performs which functions simultaneously?

A. Service relay only

B. Service relay and parking

C. Service relay, reservoir charging, emergency application

D. ABS modulation only

10. A heavy-truck air system's safety relief valve typically opens at:

A. 80 to 100 psi

B. 150 to 175 psi

C. 60 psi

D. 250 to 300 psi

11. The brake fluid reservoir cap should:

A. Allow atmospheric pressure equalization while excluding contamination

B. Be removed during cold weather

C. Be sealed completely without venting

D. Include a heating element

12. A heavy-truck wheel bearing endplay specification is typically:

A. 0.020 to 0.040 inches

B. 0.060 to 0.080 inches

C. Maximum tightness with no clearance

D. 0.001 to 0.005 inches

13. The yellow dash valve on a heavy-truck tractor controls:

A. Trailer service air

B. Compressor cut-out

C. Tractor parking brake

D. ABS warning lamp

14. The red dash valve on a heavy-truck tractor controls:

A. Compressor unload

B. Trailer supply air through the tractor protection valve

C. ABS reset

D. Engine RPM

15. The brake chamber pushrod's mechanical advantage at the slack adjuster is maximized when the geometry is approximately:

A. 90 degrees at full application

B. 45 degrees at rest

C. 180 degrees at full application

D. 60 degrees at rest

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

A. Stronger signal output

B. Improved ABS function

C. No effect on system operation

D. Weak or no signal output, possibly triggering ABS DTCs

17. The brake drum maximum discard diameter is typically:

A. 0.030 inches over nominal

B. 0.060 inches over nominal

C. 0.120 inches over nominal

D. 0.200 inches over nominal

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

A. A dedicated compressor oil reservoir

B. The engine's pressurized oil supply through an external line

C. Splash lubrication only

D. Fuel oil mixed with the air supply

19. A heavy-truck brake chamber's type number corresponds to:

A. The effective diaphragm area in square inches

B. The model year of manufacture

C. The torque rating in foot-pounds

D. The number of years of service expected

20. The brake fluid moisture content threshold for replacement is typically:

A. 1%

B. 5%

C. 10%

D. 3%

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

A. The treadle valve

B. The driver's parking brake input

C. The governor's unload signal

D. The ABS ECU

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

A. Always at the maximum mark

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

C. Below the minimum mark

D. At the minimum mark

23. The brake camshaft on an S-cam foundation brake is supported by:

A. The brake spider or a dedicated camshaft bracket bolted to the axle

B. The wheel bearing housing

C. The chamber mounting bracket only

D. The ABS modulator

24. The Type 30 standard chamber readjustment stroke limit is:

A. 1-3/8 inches

B. 1-3/4 inches

C. 2-1/2 inches

D. 2 inches

25. A heavy-truck brake chamber diaphragm is made of:

A. Solid metal

B. Plastic polymer

C. Reinforced rubber with fabric layers

D. Ceramic composite

26. The wheel bearing service interval on most heavy-truck applications is determined by:

A. Driver preference

B. Manufacturer specification — typically miles or hours of operation

C. Calendar time only

D. Tire wear pattern

27. The brake camshaft on an S-cam foundation brake rotates approximately how many degrees during a full brake application?

A. 75 to 90 degrees

B. 45 degrees

C. 180 degrees

D. 270 degrees

28. The brake fluid in a hydraulic system must be:

A. Mixed with engine oil for lubrication

B. Diluted with water before installation

C. Heated before use

D. Specified to the manufacturer's required DOT grade

29. The brake compressor is driven by:

A. A belt from the alternator

B. Hydraulic pressure from the power steering pump

C. A gear from the engine timing train

D. An electric motor

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

A. Individual components separately

B. A matched cup-and-cone set

C. Cones only

D. Cups only

31. The brake chamber's pushrod, when fully extended at 90 psi applied, should be:

A. Approximately 4 inches long

B. Approximately 1 inch long

C. Within 1/4 inch of the stroke limit

D. Within the chamber type's readjustment stroke limit

32. The brake shoe replacement procedure requires:

A. Replacement as a matched axle set

B. Replacement only on the worn side

C. Replacement of one shoe per wheel

D. Replacement only after drum machining

33. The brake fluid type specified on the master cylinder reservoir cap is:

A. The supplier's recommendation

B. The driver's preference

C. The manufacturer's specification

D. Whatever is currently in stock

34. The brake compressor's drive method affects:

A. Brake fluid pressure

B. Reliability of compressor operation under high torque loads

C. ABS modulator response time

D. Engine RPM directly

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

A. The driver applies the foot pedal

B. The ABS activates

C. The compressor cycles on

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

36. A heavy-truck disc brake caliper's piston is moved by:

A. Hydraulic pressure delivered through the brake line

B. Air pressure

C. Engine vacuum

D. Electric motor

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

A. A multimeter set to ohms

B. A pH test strip

C. An electronic brake fluid moisture tester

D. A tire pressure gauge

38. The federal regulation that defines air brake system requirements for heavy trucks is:

A. FMVSS 105

B. FMVSS 121

C. FMVSS 135

D. FMVSS 106

39. A heavy-truck wheel bearing service should always include:

A. Reuse of the original spindle nut

B. Reuse of the original wheel seal

C. Reuse of the original cotter pin

D. Replacement of the wheel seal

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

A. The engine is running

B. The brake pedal is depressed

C. The trailer is connected

D. The ABS is active

41. The trailer's relay emergency valve uses what type of logic to activate the emergency function?

A. Manual driver input only

B. Engine ECU command

C. Automatic — when supply air pressure drops below the threshold

D. ABS modulator signal

42. A heavy-truck brake hose under FMVSS 106 must withstand a minimum pressure of approximately:

A. 50 psi

B. 1,200 psi

C. 200 psi

D. 5,000 psi

43. The brake drum's friction surface temperature can exceed:

A. 100°F during normal operation

B. 200°F during normal operation

C. 50°F during normal operation

D. 700°F during a panic stop

44. The brake compressor's discharge port air is typically:

A. Hot and moisture-laden directly from the compression process

B. Cool and dry from internal heat exchanger action

C. Pressurized to exactly the governor cut-out value at all times

D. Filtered of all oil vapor before leaving the cylinder head

45. The brake fluid reservoir cap typically includes:

A. A heating element to prevent freezing

B. A magnetic separator for metal debris

C. A vent that allows atmospheric pressure equalization

D. A pressure relief valve

46. The brake compressor on a Class 8 tractor typically has a displacement of approximately:

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

47. 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 compressor to wheel

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

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

A. System pressure drops to the cut-in threshold (typically 100 to 110 psi)

B. The driver applies the brake pedal

C. The ABS activates

D. The trailer is connected

49. 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

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

A. The driver's preference

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

C. Whatever fluid is currently in stock

D. The supplier's recommendation only

PRACTICE EXAM 17 — ANSWER KEY AND EXPLANATIONS

1. B — Treadle valve. The treadle valve is the driver's primary input to the air brake system. Pedal application opens the valve, sending controlled air pressure to the chambers through the relay valves. The valve's self-lapping design holds commanded pressure constant as long as pedal position is maintained.

2. C — 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, providing the ABS ECU with accurate wheel-by-wheel speed data.

3. 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. DOT 5 silicone is incompatible and used only in specifically designated systems.

4. A — Approved silicone-based brake grease. Caliper slide pins must be lubricated with silicone-based brake grease formulated to resist heat and water, and to be compatible with rubber seals. Other lubricants such as engine oil, wheel bearing grease, or white lithium grease may damage seals or fail under brake heat conditions.

5. C — Cut-out pressure (typically 120 to 135 psi) by the governor. 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.

6. B — Tapered roller bearing. Heavy-truck wheel bearings are tapered roller bearings, designed to handle both radial and axial loads encountered 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.

7. A — 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.

8. D — Inspected for scoring, heat damage, and dimensional integrity. Brake drum friction surfaces must be inspected for scoring, heat damage (blue or rainbow discoloration), cracks, and

dimensional integrity. The drum is returned to service only if all inspection criteria are met and dimensions are within the specified range.

9. C — 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. This multifunction design is the backbone of trailer air brake safety.

10. B — 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 without normal operational interference.

11. A — Allow 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. Tight sealing prevents the hygroscopic fluid from absorbing excess moisture.

12. D — 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 — it is too small to verify by feel or torque readings alone, and it ensures proper bearing operation without overheating.

13. C — Tractor parking brake. The yellow diamond-shaped dash valve is federally standardized to control the tractor's drive-axle spring (parking) brakes. Pulling the knob exhausts air from the spring chamber control ports, allowing the power springs to apply the brakes mechanically.

14. B — Trailer supply air through the tractor protection valve. The red dash valve controls the trailer supply (emergency) air through the tractor protection valve. Pulling the red valve exhausts the control signal to the TPV, which closes and isolates the trailer from tractor air. Pushing the valve in restores the signal, opening the TPV and charging the trailer supply circuit.

15. A — 90 degrees at full application. The 90-degree geometry between pushrod and slack adjuster at full application produces maximum torque at the slack adjuster, which translates to maximum rotational force at the S-cam. As the brake wears and pushrod stroke increases, this angle changes, reducing mechanical advantage.

16. D — Weak or no signal output, possibly triggering ABS DTCs. 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. The sensor must be reinstalled with the correct gap.

17. C — 0.120 inches over nominal. The typical maximum discard diameter for heavy-truck brake drums is approximately 0.120 inches over the nominal inner diameter. The specific value is

stamped on each drum, and once the worn diameter reaches this limit, the drum must be scrapped rather than machined.

18. B — The engine's pressurized oil supply through an external line. 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 — but also means a compressor oil leak indicates a brake-system fault that must be addressed.

19. A — The effective diaphragm area in square inches. Brake chamber type numbers directly correspond to the effective diaphragm area. A Type 20 chamber has approximately 20 square inches, a Type 30 has approximately 30 square inches, and so on. Larger chambers produce more pushrod force for the same delivery pressure.

20. 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.

21. C — 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.

22. B — Within the normal operating range, between 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. Levels outside this range indicate either leakage or excessive consumption.

23. A — The brake spider or a dedicated camshaft bracket bolted to the axle. 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 and produces a distinctive clunking sound and uneven shoe spread.

24. D — 2 inches. The CVSA readjustment stroke limit for a Type 30 standard chamber is 2 inches at 90 psi applied. A Type 30 long-stroke chamber has a higher limit of 2-1/2 inches — always verify the chamber type markings before comparing stroke to a limit.

25. C — Reinforced rubber with fabric layers. The chamber's service diaphragm is a reinforced rubber disc with embedded fabric layers that provide both the strength needed to resist high cyclic pressure and the flexibility needed to move with pushrod travel. This construction balances durability against the millions of cycles the diaphragm sees over the chamber's service life.

26. B — Manufacturer specification — typically miles or hours of operation. 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 rather than generic intervals.

27. A — 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 at the foundation brake.

28. D — Specified to the manufacturer's required DOT grade. Brake fluid must match the manufacturer's specified DOT grade for the vehicle. Using the wrong grade can damage seals, alter pedal feel, and compromise braking safety. The reservoir cap and service manual specify the required grade.

29. C — 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.

30. B — 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 for proper service life.

31. D — Within the chamber type's readjustment stroke limit. The brake chamber pushrod stroke at 90 psi applied must be within the readjustment limit specified for the chamber type. Different chamber types (Type 16, 20, 24, 30, etc.) have different limits, and long-stroke versions of each have different limits than standard versions.

32. A — Replacement as a matched axle set. Brake shoes must be replaced as an axle-matched set — both wheels on the axle, both shoes per wheel. Replacing shoes on only one wheel produces uneven braking torque between the two wheels, causing brake pull and failed DOT inspection.

33. C — The manufacturer's specification. 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 throughout the system.

34. B — Reliability of compressor operation under high torque loads. Gear drive provides reliable torque transmission without slippage under heavy compressor loads, which is the primary reason it dominates over belt drive in heavy-truck applications. Belt drive can slip under high torque, leading to inconsistent compressor output and potentially shortened belt service life.

35. D — 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 (typically 60 to 70 psi). The power spring inside each chamber requires this pressure to overcome

its preload and keep the brake released. Below this threshold, the spring extends and applies the foundation brake.

36. A — Hydraulic pressure delivered through the brake line. The disc brake caliper's piston is moved by hydraulic pressure delivered through the brake line from the master cylinder. The hydraulic pressure pushes the piston outward, which in turn presses the brake pad against the rotor — generating the braking force through friction.

37. C — 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 — FMVSS 121. FMVSS 121 specifies the air brake system requirements for heavy trucks, including dual-circuit design, pressure thresholds, ABS requirements, and other safety-critical specifications. This is the foundational federal standard that all heavy-truck air brake systems must comply with.

39. D — Replacement of the wheel seal. Wheel bearing service always includes wheel seal replacement. Wheel seals are single-use components that must not be reused after the hub has been removed. Reusing a seal results in immediate leakage and bearing contamination shortly after service.

40. A — 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.

41. C — Automatic — when 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 — a critical fail-safe design.

42. B — 1,200 psi. FMVSS 106 establishes minimum pressure ratings for brake hoses, with general specifications around 1,200 psi for hydraulic hoses (specifications vary by hose type and application). The hose markings on the hose itself confirm compliance with the applicable specification.

43. D — 700°F during a panic stop. Brake drum friction surface temperature can exceed 700°F during a panic stop as the kinetic energy of the moving vehicle is converted to thermal energy through friction. This is the fundamental physics of braking, and the heat must be dissipated through the drum and surrounding components.

44. A — Hot and moisture-laden directly from the compression process. Compressed air leaves the compressor head at 300°F to 400°F under normal conditions, carrying significant water vapor that

condenses to liquid as the air cools downstream. This is why the air dryer is positioned immediately downstream of the compressor to remove that moisture before it reaches the reservoirs.

45. 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 (during braking and from temperature changes) while excluding moisture and dirt contamination. Tight sealing prevents the hygroscopic fluid from absorbing excess moisture.

46. 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.

47. D — 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 (drum brakes) or calipers (disc brakes), where it generates the braking force at each wheel.

48. A — System pressure drops to 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.

49. 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. Levels outside this range indicate either leakage or excessive consumption.

50. B — 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 information confirms it. Mixing fluid types or using the wrong specification can damage seals and components throughout the system.