

# PRACTICE EXAM 7: ASE T4 BRAKES SIMULATION

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1. The compressor on a heavy-truck air brake system is typically driven by:
  - A. A belt from the engine crankshaft
  - B. An electric motor powered by the battery
  - C. A gear from the engine timing train
  - D. Hydraulic pressure from the power steering pump
  
2. Governor cut-out pressure on a modern heavy-truck system is typically set at:
  - A. 80 to 95 psi
  - B. 120 to 135 psi
  - C. 150 to 170 psi
  - D. 185 to 200 psi
  
3. A torn chamber diaphragm will produce which symptom?
  - A. Slow compressor pressure buildup
  - B. Excessive drum temperature
  - C. Parking brake release failure
  - D. Audible air leak during service brake application

4. The purpose of the double-check valve in the spring brake modulation circuit is to:

- A. Select the higher of two input pressures
- B. Regulate compressor output
- C. Modulate ABS pressure during cycles
- D. Limit brake fluid return pressure

5. DOT 5 brake fluid is compatible with which other DOT specification?

- A. DOT 3 only
- B. DOT 4 only
- C. Only DOT 5
- D. DOT 3 and DOT 4

6. The air dryer purge valve opens in coordination with:

- A. Compressor load signal
- B. Governor unload signal
- C. Treadle valve application
- D. ABS modulator activation

7. A seized caliper slide pin causes:

- A. Complete loss of hydraulic pressure
- B. Activation of the ABS warning lamp
- C. Increased compressor duty cycle
- D. Uneven pad wear on one caliper

8. The red gladhand carries:

- A. Supply (emergency) air to the trailer
- B. Service signal air to trailer brakes
- C. Electrical power to trailer lights
- D. Coolant to the trailer ABS unit

9. A Type 30 standard chamber has a readjustment stroke limit of:

- A. 1-3/8 inches
- B. 1-3/4 inches
- C. 2 inches
- D. 2-1/2 inches

10. The wheel bearing endplay specification for most commercial vehicles is:

- A. 0.010 to 0.020 inches
- B. 0.001 to 0.005 inches
- C. 0.030 to 0.050 inches
- D. 0.060 to 0.090 inches

11. A vacuum brake booster's check valve failure causes:

- A. Loss of reserve assist after engine shutdown
- B. Complete loss of service braking
- C. Activation of the parking brake
- D. Excessive pedal return pressure

12. Two technicians discuss slack adjusters. Technician A says automatic slack adjusters self-compensate during ABS events. Technician B says manual adjustment of an ASA is acceptable to correct excessive stroke. 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

13. The FMVSS 121 low-air pressure warning must activate at:

- A. 40 psi minimum
- B. 50 psi minimum
- C. 60 psi maximum
- D. 80 psi maximum

14. A 4S/4M ABS configuration has:

- A. Two sensors and four modulators
- B. Four sensors and four modulators
- C. Six sensors and two modulators
- D. Four sensors and two modulators

15. A brake shoe must be replaced when:

- A. Lining thickness falls below 1/4 inch
- B. Any visible surface contamination appears
- C. The shoe table shows light rust

D. Return spring color changes slightly

16. The primary reason heavy trucks use spring brake chambers is:

- A. Lower cost than drum shoes
- B. Reduced weight at the wheel end
- C. Better heat dissipation
- D. Fail-safe parking brake function

17. A driver reports brake pull to the right during application. Likely cause is:

- A. Over-adjusted left front slack adjuster
- B. Fully functional right front caliper
- C. Contaminated left front friction material
- D. Normal behavior on loaded trailers

18. The tractor protection valve closes at approximately:

- A. 60 to 70 psi
- B. 20 to 45 psi
- C. 10 to 15 psi
- D. 80 to 100 psi

19. A Pascal's Law application in hydraulic brakes means:

- A. Pressure transmits equally throughout confined fluid
- B. Force decreases with distance from the master cylinder

- C. Brake fluid compresses slightly under high pressure
- D. Hydraulic pressure varies by line diameter

20. A cassette-style wheel seal integrates:

- A. The bearing cone and outer race
- B. The dust boot and grease fitting
- C. The hub cap and drain plug
- D. The sealing element and wear sleeve

21. Under CVSA criteria, out-of-service is triggered when defective brakes reach:

- A. 10% of total
- B. 15% of total
- C. 20% of total
- D. 25% of total

22. The air compressor's unloader valve is signaled to open by:

- A. Governor sensing reservoir pressure at cut-out
- B. Treadle valve application
- C. ABS ECU during modulation
- D. Driver-activated dash switch

23. Brake fluid moisture content exceeding 3% indicates:

- A. Fluid is performing at its best

- B. Fluid should be replaced
- C. System has been recently serviced
- D. ABS is overriding normal fluid function

24. When a Hydromax backup pump activates, it is triggered by:

- A. Engine start signal
- B. ABS fault code
- C. Parking brake release
- D. Loss of primary pressure from power steering

25. The minimum disc brake pad thickness is typically:

- A. 5 mm remaining material
- B. 4 mm remaining material
- C. 2 to 3 mm remaining material
- D. 0.5 mm remaining material

26. A cam-follower roller on an S-cam brake is located:

- A. At the upper end of each shoe
- B. Inside the chamber diaphragm
- C. Between the drum and the hub
- D. At the anchor pin position

27. The combination valve in a hydraulic system typically includes all EXCEPT:

- A. A pressure-differential switch
- B. An ABS modulator solenoid
- C. A proportioning valve
- D. A metering valve

28. A driver's pedal sinks to the floor under steady pressure with no external leak. The likely cause is:

- A. Air in the hydraulic lines
- B. Collapsed flex hose
- C. Over-adjusted rear brakes
- D. Master cylinder internal bypass

29. An oil-bath hub's sight glass shows oil below the "Add" line. The correct action is:

- A. Continue driving until PM interval
- B. Top off the oil immediately
- C. Investigate the leak before topping off
- D. Replace the hubcap only

30. The FMVSS 121 pressure buildup requirement is approximately:

- A. 85 to 100 psi within 45 seconds
- B. 60 to 80 psi within 30 seconds
- C. 100 to 120 psi within 60 seconds
- D. 120 to 135 psi within 20 seconds

31. An air compressor that runs continuously at pressure above cut-out indicates:

- A. Normal operation at high demand
- B. Governor failure to signal unload
- C. Leaking treadle valve
- D. Failed ABS modulator

32. The primary safety risk during spring brake service is:

- A. Electrical shock from the ECU
- B. High-pressure brake fluid spray
- C. Accidental drum ignition
- D. Stored mechanical energy in the power spring

33. The J1939 data bus on a heavy truck connects:

- A. Only the ABS ECU to the treadle valve
- B. Only the engine to the transmission
- C. Multiple vehicle systems including brakes and engine
- D. Only the trailer to the dash display

34. An ABS fault code "wheel speed sensor signal lost" most commonly points to:

- A. Excessive air gap at the sensor tip
- B. Engine oil pressure low
- C. Tire pressure low
- D. Faulty pedal-stop switch

35. The typical compressor displacement on a Class 8 tractor is approximately:

- A. 3 to 5 CFM at 1,250 RPM
- B. 40 to 50 CFM at 1,250 RPM
- C. 80 to 100 CFM at 1,250 RPM
- D. 13 to 18 CFM at 1,250 RPM

36. A disc brake caliper's square-cut seal provides:

- A. A hydraulic relief function
- B. Automatic piston retraction after release
- C. Dust exclusion from the rotor
- D. Thermal insulation of the piston

37. Two technicians discuss hydraulic brake bleeding. Technician A says fresh DOT fluid from a sealed container should be used. Technician B says the master cylinder reservoir must be kept topped up throughout bleeding. 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

38. The NLGI grease classification for heavy-truck wheel bearings is:

- A. GC-LB
- B. GA-LA
- C. GD-LD

D. GE-LC

39. A brake drum's maximum discard diameter is typically:

- A. 0.030 inches over nominal
- B. 0.060 inches over nominal
- C. 0.200 inches over nominal
- D. 0.120 inches over nominal

40. The primary reason a brake chamber must return to 90-degree geometry is to:

- A. Prevent air leak at the service port
- B. Produce maximum mechanical advantage at the S-cam
- C. Reduce chamber diaphragm wear
- D. Enable parking brake function

41. A trailer equipped with ABS but no working warning lamp is:

- A. Operating safely with full ABS protection
- B. Safe if the driver carries a backup lamp
- C. A safety fault that must be repaired
- D. Exempt from FMVSS 121 requirements

42. Brake shoes on a drive axle must be replaced:

- A. As a matched axle set
- B. Only on the side showing wear

- C. In individual shoe pairs
- D. Only after drum replacement

43. A hydro-boost unit uses which hydraulic source?

- A. ABS modulator output
- B. Trailer brake circuit
- C. Cooling system pressure
- D. Power steering pump pressure

44. An air compressor with worn piston rings will produce:

- A. Excessive discharge pressure
- B. Oil carryover into the air system
- C. Loss of reservoir capacity
- D. Activation of the parking brake

45. A Class 5 medium-duty truck with diesel engine uses the brake booster's vacuum source from:

- A. Intake manifold directly
- B. Exhaust gas recirculation
- C. A belt-driven vacuum pump
- D. A dedicated air compressor

46. The yellow dash valve on a tractor controls:

- A. Tractor drive-axle parking brake
- B. Trailer supply air
- C. Service brake priority
- D. ABS warning lamp function

47. A driver reports spongy pedal feel. The MOST likely cause is:

- A. Over-adjusted wheel bearings
- B. Corroded ABS tone ring
- C. Failed master cylinder return spring
- D. Air in the hydraulic lines

48. The relay emergency valve on a trailer performs how many simultaneous functions?

- A. Two — service and parking
- B. Three — service relay, reservoir charging, emergency
- C. Four — service, parking, ABS, supply
- D. Only one — service relay

49. A brake rotor with excessive thickness variation causes:

- A. Complete loss of braking at one wheel
- B. ABS warning lamp illumination
- C. Low-air pressure warning
- D. Pedal pulsation during application

50. The primary purpose of the anti-compounding circuit is to:

- A. Prevent combined service and spring forces from exceeding foundation brake limits
- B. Boost spring brake force during emergencies
- C. Modulate ABS cycling speed
- D. Regulate compressor output frequency

# PRACTICE EXAM 7 — ANSWER KEY AND EXPLANATIONS

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1. C — A gear from the engine timing train. Heavy-truck air compressors are driven by a gear meshed directly with the engine's timing gear train. This drive method eliminates belt slippage, handles high torque loads reliably, and aligns the compressor with the engine's shared lubrication and coolant circulation systems.
2. B — 120 to 135 psi. Standard governor cut-out pressure on modern heavy-truck air systems falls within the 120 to 135 psi range. This setting provides adequate reserve pressure for multiple full-pressure brake applications while keeping component stress and compressor duty cycle within safe operating parameters.
3. D — Audible air leak during service brake application. A torn chamber diaphragm allows air to escape from the service cavity to atmosphere during application. The distinctive diagnostic fingerprint is an audible leak at the chamber that stops when the brake is released — the inlet seat closes completely in the at-rest position.
4. A — Select the higher of two input pressures. The double-check valve contains a shuttle that automatically seals against the lower-pressure inlet and passes the higher-pressure source through the outlet. This selection function enables spring brake modulation during a primary-circuit failure by routing the highest available pressure to the chambers.
5. C — Only DOT 5. DOT 5 is silicone-based, while DOT 3, DOT 4, and DOT 5.1 are glycol-based. Silicone and glycol chemistries are incompatible — mixing them causes seal swelling, poor pedal feel, and system failure. DOT 5 must be used only in systems specifically designed for silicone fluid.
6. B — Governor unload signal. When the governor signals the compressor to unload at cut-out, it simultaneously signals the air dryer to open its purge valve. This coordinated timing allows the desiccant to regenerate by using stored dry air to purge accumulated moisture and contamination while the compressor is not producing new air.
7. D — Uneven pad wear on one caliper. A seized slide pin prevents the caliper from floating inboard as the inner pad wears. The inner pad continues to wear while the outer pad receives insufficient force, producing drastically uneven wear between the two pads on the same caliper — the distinctive fingerprint of slide pin seizure.
8. A — Supply (emergency) air to the trailer. The red gladhand carries supply air that charges the trailer reservoir and releases the trailer spring brakes. Loss of supply air (disconnected or ruptured

red line) causes the trailer's spring brakes to apply mechanically through the relay emergency valve's backup function.

9. C — 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 (marked with "L" or raised square identifier) has a higher limit of 2-1/2 inches — always verify the chamber type markings before comparing stroke to a limit.
10. B — 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.
11. A — Loss of reserve assist after engine shutdown. The check valve holds reserve vacuum in the booster between engine cycles, providing 2 to 3 assisted stops after the engine stops. When the check valve fails, reserve assist is lost — subsequent stops after engine shutdown become progressively harder as reserve vacuum bleeds away.
12. D — Neither Technician A nor Technician B. Technician A is wrong because ASAs self-compensate during normal brake applications based on stroke travel, not during ABS events. Technician B is wrong because manually adjusting an ASA to correct excessive stroke is explicitly prohibited — it masks an underlying failure and is cited in FMCSA guidance.
13. C — 60 psi maximum. FMVSS 121 requires the low-air pressure warning device to activate at no higher than 60 psi. This threshold gives the driver enough reserve pressure to bring the vehicle to a safe stop before the tractor protection valve closes and trailer supply air is cut off.
14. B — Four sensors and four modulators. A 4S/4M ABS configuration has four wheel speed sensors and four independent modulator channels, allowing the ECU to release, hold, and reapply pressure at each wheel independently. This granularity produces optimal control on split-friction surfaces.
15. A — Lining thickness falls below 1/4 inch. The minimum replacement thickness for heavy-truck brake shoe linings is approximately 1/4 inch of remaining friction material over the shoe table (bonded) or over the rivet heads (riveted). Shoes must be replaced as an axle-matched set when any lining reaches this threshold.
16. D — Fail-safe parking brake function. Spring brake chambers use a preloaded power spring that applies the foundation brake mechanically when control air is released. This design is fail-safe — loss of air pressure (the most common failure mode) automatically applies the parking brake, preventing a parked truck from rolling.
17. C — Contaminated left front friction material. Contaminated linings on one wheel reduce friction coefficient on that side, producing weaker braking at that wheel. The vehicle pulls toward the side with the stronger (uncontaminated) brake — in this case, toward the right.

18. B — 20 to 45 psi. The tractor protection valve automatically closes when tractor air pressure drops below approximately 20 to 45 psi. This threshold is well below the 60-psi low-air warning, ensuring the driver has received a warning and had time to stop before the trailer is isolated.
19. A — Pressure transmits equally throughout confined fluid. Pascal's Law states that pressure applied to a confined incompressible fluid is transmitted equally and undiminished in all directions. This principle is the physical basis of hydraulic brake operation, enabling force generated at the master cylinder to reach every wheel cylinder and caliper at the same pressure.
20. D — The sealing element and wear sleeve. Cassette-style unitized wheel seals integrate the sealing lip and its wear sleeve into a single pre-assembled unit. This factory-set geometry between lip and sleeve prevents installation errors that would otherwise compromise seal performance when the two parts are fitted separately.
21. C — 20% of total. CVSA criteria place a vehicle out of service when 20% or more of its brakes are defective. On a 10-brake combination, 2 or more out-of-adjustment brakes trigger OOS status and the vehicle cannot be moved until the defects are corrected.
22. A — Governor sensing reservoir pressure at cut-out. The governor monitors supply reservoir pressure and, when cut-out is reached, sends a control air signal to the compressor's unloader valve assembly. This signal holds the inlet valves open so the compressor rotates without compressing air until the cut-in pressure is reached.
23. B — Fluid should be replaced. Moisture content above 3% is the industry replacement threshold. Moisture significantly lowers the fluid's wet boiling point, increasing fade risk under hard braking. Glycol-based brake fluids are hygroscopic and must be periodically replaced to maintain their boiling point specification.
24. D — Loss of primary pressure from power steering. The Hydromax's electric backup pump activates when a pressure switch senses that primary pressure (from the power steering pump) has fallen below the designed threshold. The electric pump then provides reserve assist pressure to maintain power-assisted braking during primary source failure.
25. C — 2 to 3 mm remaining material. The minimum replacement thickness for disc brake pads is typically 2 to 3 mm of remaining friction material over the steel backing plate. Most pads include mechanical or electrical wear indicators to alert the driver before reaching this minimum, allowing replacement before metal-to-rotor contact occurs.
26. A — At the upper end of each shoe. Cam-follower rollers are positioned at the top of each brake shoe, where they ride on the S-cam's profile. As the camshaft rotates during application, the rollers ride up the cam surface and force the shoes outward against the drum.
27. B — An ABS modulator solenoid. The combination valve integrates three hydraulic functions: pressure-differential switch, metering valve, and proportioning valve. ABS modulator solenoids

are housed in a separate hydraulic control unit (HCU) and are not part of the combination valve assembly.

28. D — Master cylinder internal bypass. A pedal that sinks under steady pressure with no external leak is the classic fingerprint of internal bypass past a worn master cylinder piston seal. Fluid moves past the worn seal within the cylinder rather than escaping the system — the distinctive diagnostic pattern for this specific failure.
29. C — Investigate the leak before topping off. Oil below the "Add" line indicates lubricant loss that must be diagnosed before adding more oil. Simply topping off without finding the leak source results in recurring low-oil conditions and potential bearing damage once the seal or hub defect is uncorrected.
30. A — 85 to 100 psi within 45 seconds. FMVSS 121 requires the air system to build pressure from 85 psi to 100 psi within approximately 45 seconds on a single-unit vehicle. Exceeding this buildup time indicates either significant leakage or compressor wear and is grounds for inspection violation.
31. B — Governor failure to signal unload. When system pressure rises above cut-out and the compressor continues pumping, the governor has failed to send the unload signal. The compressor continues to produce air unnecessarily, stressing the system and potentially triggering the safety relief valve at the supply reservoir.
32. D — Stored mechanical energy in the power spring. The power spring inside a spring brake chamber stores 1,500 to 2,000 pounds of mechanical force that can release catastrophically during improper disassembly. This stored energy has caused fatal injuries to technicians who disassembled chambers without proper caging procedures.
33. C — Multiple vehicle systems including brakes and engine. The J1939 serial data bus is the standard heavy-truck communication protocol linking the ABS ECU, engine ECM, transmission ECU, and other vehicle systems. This multi-system connectivity enables integrated functions like ATC engine torque reduction and ESC coordinated interventions.
34. A — Excessive air gap at the sensor tip. The most common cause of a "wheel speed sensor signal lost" fault code is improper sensor installation after wheel-end service. The sensor was not pressed fully into its mount, leaving an excessive air gap that weakens the signal below detection threshold.
35. D — 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.
36. B — Automatic piston retraction after release. The square-cut caliper seal deforms slightly under pressure and elastically springs back when pressure is released, pulling the piston back into its bore. This automatic retraction eliminates the need for a self-adjuster mechanism and keeps pad-to-rotor clearance minimal regardless of pad wear.

37. C — Both Technician A and Technician B. Both statements are correct and represent universal hydraulic bleeding rules. Fresh fluid from a sealed container ensures no moisture or contamination is introduced, and keeping the master cylinder reservoir topped up prevents air from being drawn back into the system — if the reservoir runs dry, the entire bleeding procedure must be restarted.
38. A — GC-LB. The NLGI GC-LB classification covers greases formulated specifically for the combined severe service conditions of wheel bearings and chassis — high temperature tolerance, heavy shock loading, and water resistance. GC-LB is the industry standard for heavy-truck wheel bearing applications.
39. D — 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.
40. B — Produce maximum mechanical advantage at the S-cam. The 90-degree geometry between pushrod and slack adjuster at full application produces maximum torque at the slack adjuster, which maximizes rotational force at the S-cam. As the brake wears and pushrod stroke increases, this angle changes and mechanical advantage is lost.
41. C — A safety fault that must be repaired. FMVSS 121 requires a working ABS warning lamp because the driver must be able to recognize an ABS fault. A non-functional warning lamp is itself a safety-critical fault — the driver would have no way to know if the ABS system had failed, defeating the protection the regulation is designed to provide.
42. A — 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.
43. D — Power steering pump pressure. Hydro-boost units use high-pressure hydraulic fluid from the power steering pump acting on an internal piston to generate brake assist force. This design is dominant on diesel-powered medium-duty trucks where vacuum is inadequate for vacuum boosters.
44. B — Oil carryover into the air system. Worn compressor piston rings allow engine oil to bypass into the discharge air stream. The oil then accumulates in the air dryer, supply reservoir, and downstream components, producing characteristic oil film throughout the supply-side system — a signature diagnostic for internal compressor wear.
45. C — A belt-driven vacuum pump. Diesel engines produce very little intake manifold vacuum because they are not throttled like gasoline engines. Diesel-powered medium-duty trucks therefore use a belt-driven or engine-driven vacuum pump to supply the brake booster with its required vacuum source.

46. A — Tractor drive-axle 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.
47. D — Air in the hydraulic lines. A spongy pedal is the classic symptom of compressible air in the hydraulic circuit. Air absorbs pedal effort as compression rather than transmitting it as hydraulic pressure, violating Pascal's Law requirements. Proper system bleeding removes the air and restores firm pedal feel.
48. B — Three — service relay, reservoir charging, emergency. The trailer relay emergency valve performs three simultaneous functions: amplifying service signal from the tractor, charging the trailer reservoir from supply air, and automatically applying the trailer brakes from reservoir air during supply loss. This multifunction design is the backbone of trailer air brake safety.
49. D — Pedal pulsation during application. Rotor thickness variation around the circumference causes the caliper pistons to alternately press harder and softer against the pads as the rotor rotates. This alternating clamping produces the characteristic pulsation the driver feels in the pedal — measured with a micrometer and corrected through machining (if thickness permits) or replacement.
50. A — Prevent combined service and spring forces from exceeding foundation brake limits. Anti-compounding circuits use a double-check valve or dedicated valve to ensure that when both service and spring brake applications occur simultaneously, only the larger force is transmitted to the foundation brake. Without this protection, combined forces could cause broken shoes, cracked drums, or bent slack adjusters.