PRACTICE EXAM 11: ASE T3 DRIVE TRAIN SIMULATION

1. A heavy-duty truck has been operating for several months with a hydraulic clutch system requiring weekly reservoir top-offs. No external leaks are visible at the slave cylinder or master cylinder. The MOST likely explanation is:

A. Driver overuse of the clutch creating heat that consumes the fluid

B. Normal evaporation of the brake fluid through the reservoir cap vent

C. Air contamination being absorbed and released by the hydraulic fluid

D. Internal master cylinder bypass returning fluid back to the reservoir

2. Technician A says that the pressure plate cover on a heavy-duty clutch can be torqued in any sequence as long as final torque values are reached. Technician B says the cover bolts must be torqued in a cross-pattern sequence to prevent distortion. Who is correct?

A. Technician A only

B. Both Technician A and Technician B

C. Technician B only

D. Neither Technician A nor Technician B

3. A driver complains of clutch chatter that occurs only when launching from a stop with a heavy trailer attached. The chatter does not occur on bobtail driving. The MOST likely cause is:

A. Pilot bearing failure from inadequate lubrication during recent service operations

B. Worn engine and transmission mounts allowing powertrain oscillation under load

C. Air contamination in the hydraulic clutch system requiring complete bleeding

D. Heat-checked flywheel friction surface producing chatter during normal engagement

4. The PRIMARY reason a heavy-duty Class 8 transmission uses a twin countershaft design is to:

A. Reduce overall transmission length compared to single-countershaft designs

B. Allow easier replacement of individual gear sets during service operations

C. Simplify the lubrication system through gravity-fed oil distribution patterns

D. Distribute torque load across two shafts to handle higher torque capacity

5. A heavy-duty truck has a complaint of growling noise from the rear axle area that varies with vehicle speed under both drive and coast conditions. The MOST likely source is:

A. Wheel bearings or side bearings that have failed and require replacement

B. The ring and pinion drive-side tooth contact pattern requiring adjustment

C. The differential lockout sliding clutch dragging during normal operation

D. The pinion seal allowing oil to escape from the carrier housing assembly

6. The MOST important reason for measuring driveline working angles using the OEM-specified ride height is:

A. The truck's frame rail flexes at different ride heights, affecting accuracy

B. The OEM specification accounts for tire pressure variations during operation

C. Driveline angles change with suspension position, and measurements must reflect operation

D. The transmission output shaft position varies with engine mount thermal expansion

7. A driver reports that his AMT-equipped tractor has refused to complete a shift to a higher gear, with the dashboard indicator showing a transmission warning light. The driver has reached a safe pull-over location. The technician's FIRST step should be to:

A. Disassemble the transmission to inspect internal shift components for damage

B. Connect the OEM-approved scan tool to read active and stored fault codes

C. Replace the transmission control module assuming an electronic failure

D. Verify system air pressure meets the minimum specification for shift operation

8. The collapsible spacer in a heavy-duty drive axle pinion bearing assembly is designed to:

A. Provide axial spacing between the pinion gear and the rear of the carrier housing

B. Maintain constant lubricant flow between the inner and outer pinion bearings

C. Act as a reusable shim for adjusting pinion depth during repeated rebuilds

D. Crush to a precise length under nut torque to set bearing preload

9. A heavy-duty Class 8 tractor has been operating with the inter-axle differential lockout engaged on dry highway pavement at 60 mph. After 15 minutes, the driver reports unusual driveline noise. The MOST likely consequence of continuing operation is:

A. Tire scrub and driveline binding leading to potential component damage

B. Slight increase in axle lubricant temperature without significant other effects

C. Improved fuel economy from increased traction at the rear axle position

D. Better steering response on long straightaways during operation

10. Technician A says that a non-synchronized constant-mesh transmission requires the driver to double-clutch when shifting between gears. Technician B says that float shifting (shifting without clutch use) is possible on these transmissions if engine speed is correctly matched. 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

11. A heavy-duty drive axle is being inspected. The technician finds the ring gear teeth show wear contact biased toward the toe (inner) end of each tooth. The correction is to:

A. Increase ring gear backlash by relocating the side bearing shim packs

B. Replace the entire ring and pinion as a matched set with new components

C. Tighten the pinion nut to increase pinion bearing preload during operation

D. Reduce pinion shim thickness to move the pinion away from the ring gear

12. The wheel bearing adjustment procedure on a heavy-duty drive axle hub typically involves:

A. Tightening the spindle nut to maximum specification and locking it permanently

B. Torquing to initial specification while rotating the hub, then backing off and finalizing per OEM

C. Hand-tightening the nut until snug, then backing off one full turn before locking

D. Using a torque wrench to apply only the maximum spec value without rotating the hub

13. A driver complains of a rattling noise at engine idle that disappears when the clutch pedal is depressed. The transmission is in neutral. The MOST likely cause is:

A. Broken clutch disc damper springs rattling against the disc hub assembly

B. Clutch release bearing failure causing rattle against the pressure plate fingers

C. Pilot bearing failure from inadequate lubrication during recent service operations

D. Transmission countershaft bearings worn and producing noise during operation

14. The PRIMARY function of the cushion springs in a heavy-duty clutch disc is to:

A. Absorb engine combustion pulses before they reach the transmission

B. Maintain disc thickness as friction material wears throughout service

C. Soften initial clutch engagement by allowing controlled facing compression

D. Hold the friction facings against the splined hub during disengagement

15. A heavy-duty truck has a complaint of repeated pinion seal failures, with three previous seals failing within 25,000 miles each. The technician should investigate:

A. The driver's habits regarding cornering speed and braking pattern intensity

B. The pinion yoke surface for grooving or wear that damages the seal lip

C. The ring and pinion backlash measurement for excessive specification deviation

D. The hub bore on each wheel position for damage preventing seal seating

16. The MOST common cause of failure when installing a new universal joint on a driveshaft is:

A. Misalignment of a needle bearing during cup installation causing joint binding

B. Using the wrong grade of chassis lubricant in the u-joint grease fitting

C. Overtightening the u-joint strap bolts beyond the manufacturer specification

D. Installing the joint without marking driveshaft orientation before removal

17. Technician A says that a hypoid drive axle gear set has the pinion offset above the ring gear centerline. Technician B says an amboid gear set has the pinion offset below the ring gear centerline. Who is correct?

A. Technician A only

B. Both Technician A and Technician B

C. Technician B only

D. Neither Technician A nor Technician B

18. A driver complains that his clutch pedal sinks slowly to the floor when held depressed at a stop light. The pedal returns to normal height when released. The MOST likely cause is:

A. External slave cylinder leakage onto the bell housing during operation

B. Air trapped in the hydraulic system that has not been properly bled out

C. Internal master cylinder seal failure allowing fluid bypass past the piston

D. Wear in the clutch master cylinder pushrod where it contacts the pedal

19. The transmission case vent on a heavy-duty manual transmission allows the case to:

A. Allow lubricant to circulate from the case to an external cooler unit

B. Equalize internal pressure as air expands and contracts with temperature

C. Provide an inspection point for checking transmission fluid level

D. Return vaporized lubricant to the case after operation cooling

20. A heavy-duty drive axle has been rebuilt. During the final tooth contact pattern check, the contact pattern appears low on the tooth face near the flank (bottom). This indicates:

A. The pinion is too deep and requires reduced shim thickness behind the head

B. Backlash is excessive and requires reduction by side bearing adjustment

C. The pinion is too shallow and requires increased shim thickness behind the head

D. The ring gear is installed backwards on the differential case mounting flange

21. A heavy-duty truck has a complaint of jumping out of fifth gear under load on grades. All other gears hold properly. The MOST efficient diagnostic action is to:

A. Replace the entire transmission with a remanufactured unit to ensure reliability

B. Check the transmission fluid level and verify it meets the OEM viscosity grade

C. Adjust all shift detent springs to higher tension to prevent collar movement

D. Inspect the fifth-gear clutching collar, mating gear, and shift fork specifically

22. The MOST common cause of premature universal joint failure on heavy-duty trucks is:

A. Operating the vehicle at speeds above the manufacturer's rated maximum

B. Manufacturing defects in the universal joint cross or bearing cup assemblies

C. Inadequate lubrication during scheduled chassis service intervals routinely

D. Use of incorrect grease formulations incompatible with the cup material used

23. Technician A says that the differential lockout on a drive axle is engaged through an electric solenoid energized by a dash switch. Technician B says the differential lockout uses air pressure to engage a sliding clutch in the differential case. 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

24. A heavy-duty truck has a complaint of clutch slippage under heavy load. Inspection finds friction facings within wear limits, free travel correct, and no oil contamination on the disc. The MOST likely cause is:

A. Fatigued pressure plate springs that no longer generate full clamping force

B. Air contamination in the hydraulic clutch system requiring complete bleeding

C. Driver technique issues causing accelerated wear on the friction surfaces

D. Excessive clutch pedal height adjustment outside of OEM specification

25. The torque capacity rating of a heavy-duty clutch should be:

A. Less than the engine's peak torque to allow controlled slippage under shock loads

B. Exactly equal to the engine's peak torque output with no additional safety margin

C. Greater than the engine's peak torque output by an application-appropriate margin

D. Twice the engine's peak torque output to handle all possible operating conditions

26. A driver complains of driveline vibration that worsens significantly when the truck is loaded with freight. When empty, the vibration is minimal. This load-sensitive pattern indicates:

A. Universal joint balance weights that have shifted from original positions

B. Driveshaft imbalance from accumulated debris inside the tubing assembly

C. Center support bearing rubber that has hardened from age and heat exposure

D. Driveline working angles that change with suspension position under load

27. The PRIMARY function of the transmission case vent on a heavy-duty manual transmission is to:

A. Allow lubricant to circulate from the case to an external cooler unit

B. Equalize internal pressure as air expands and contracts with temperature

C. Provide an inspection point for checking transmission fluid level

D. Return vaporized lubricant to the case after operation cooling

28. A heavy-duty drive axle is being inspected during overhaul. The technician finds the side gear thrust washers measure 0.045 inches when the OEM specification is 0.050 inches minimum. The correct action is to:

A. Reuse the thrust washers if they show no visible scoring or damage on the surface

B. Sand the thrust washer surfaces flat and reinstall them in original positions

C. Replace the thrust washers because they are below the minimum specification

D. Install thicker washers from a different axle model to compensate for the wear

29. Technician A says that the inter-axle driveshaft on a tandem-axle truck connects the rear of the forward-rear axle to the front of the rear-rear axle pinion yoke. Technician B says that the inter-axle driveshaft connects the transmission to the forward-rear axle pinion yoke. Who is correct?

A. Technician A only

B. Both Technician A and Technician B

C. Technician B only

D. Neither Technician A nor Technician B

30. The MOST important reason for replacing flywheel mounting bolts during flywheel service on modern heavy-duty engines is:

A. The original bolts cost less to replace than the labor to inspect them

B. The bolts are torque-to-yield design and cannot be safely reused after installation

C. The original bolts may have collected debris that affects torque accuracy

D. The OEM warranty requires new bolts as part of the standard service procedure

31. A heavy-duty truck has been operating with a transmission that produces a whining noise only in third gear. All other gears operate silently. This pattern points to:

A. The transmission input shaft bearing carrying torque from the engine

B. The countershaft rear bearing experiencing wear at extended intervals

C. The transmission output shaft carrying torque to the driveshaft assembly

D. The third-gear mainshaft and countershaft gear pair specifically

32. The proper way to immobilize the ring gear during a backlash measurement is to:

A. Apply hand pressure to the ring gear teeth from outside the carrier housing

B. Place a wedge between the pinion gear and the carrier housing surface

C. Hold the ring gear stationary while rotating the pinion through clearance

D. Use a magnetic base attached to the differential case mounting surface

33. A heavy-duty truck has a complaint of clutch grabbing during initial engagement. Inspection finds oil on both faces of the clutch disc friction material. The MOST likely root cause to investigate first is:

A. The rear engine main seal or transmission input shaft seal allowing leakage

B. The transmission shift cover gasket allowing oil to migrate through case

C. The driveshaft slip joint splines allowing transmission fluid to escape

D. The clutch hydraulic master cylinder leaking fluid into the pedal area

34. The PRIMARY function of an inter-axle differential (power divider) on a tandem-axle truck is to:

A. Provide engine braking force through hydraulic retarder mechanism action

B. Allow torque transmission to both axles while accommodating speed differences

C. Multiply torque between the forward-rear and rear-rear drive axles

D. Act as a final reduction stage in heavy-duty vocational truck applications

35. A driver complains that his Class 8 tractor with a 13-speed transmission has range shifts that fail to complete during cold mornings. Once the truck warms up, range shifts work normally. The MOST likely cause is:

A. Worn synchronizers in the auxiliary section requiring complete replacement

B. Low transmission oil viscosity preventing proper shift fork movement

C. Damaged shift detent springs in the range section of the transmission

D. Moisture in the air system freezing in the range shift valves during cold

36. The MOST important diagnostic tool for AMT (automated manual transmission) service is:

A. A standard digital multimeter for checking electrical circuit voltages only

B. A pneumatic tester for verifying air system pressure throughout the truck

C. The OEM-approved scan tool for reading fault codes and live data

D. A mechanical pressure gauge for measuring hydraulic clutch system pressure

37. A heavy-duty Class 8 tractor with a long wheelbase has a vibration that appears at exactly 50 mph and disappears at 45 or 55 mph. The MOST likely cause is:

A. Center support bearing rubber mount producing speed-specific resonance

B. Imbalance in the rear section of the two-piece driveshaft assembly

C. Worn universal joint at the drive axle pinion yoke connection point

D. Loose pinion nut on the drive axle allowing pinion shaft movement

38. The function of the slip joint in a driveshaft assembly is to:

A. Multiply torque between the transmission output and drive axle pinion

B. Accommodate axial distance changes between transmission and drive axle

C. Provide a coupling point for the center support bearing assembly

D. Reduce the rotational speed of the driveshaft to prevent resonance

39. A heavy-duty truck has clutch slippage that occurs only when the engine is hot. The friction facings are within wear limits and free travel is correct. The MOST likely cause is:

A. Worn cushion springs that have lost flexibility through normal service life

B. Air contamination in the hydraulic system worsening with operating heat

C. Incorrect clutch torque capacity rating for the engine application installed

D. Pressure plate diaphragm spring losing tension as operating temperature increases

40. Technician A says that hypoid drive axles can use standard SAE 90 gear oil without affecting performance. Technician B says hypoid axles require extreme-pressure (EP) gear oil to prevent metal-to-metal contact. Who is correct?

A. Technician A only

B. Both Technician A and Technician B

C. Technician B only

D. Neither Technician A nor Technician B

41. A heavy-duty drive axle is being rebuilt. The technician is establishing pinion depth and finds the pinion head stamped "+3" indicating a depth variation. This number means:

A. The pinion is 0.003 inches longer than nominal, requiring reduced shim thickness

B. The pinion has been used for 3,000 hours and requires immediate replacement

C. The pinion bearing preload should be set 3 inch-pounds above the standard spec

D. The pinion gear has 3 fewer teeth than the standard production specification

42. The MOST important reason for marking the orientation of a driveshaft to its yokes before removal is to:

A. Identify which u-joint should be replaced first during the rebuild procedure

B. Preserve the factory balance relationship when the driveshaft is reinstalled

C. Ensure the slip joint is reassembled with correct internal spline alignment

D. Allow the technician to detect any twisting damage that occurred during operation

43. A heavy-duty drive axle is being inspected. The lubricant drained from the axle has a milky white appearance with normal lubricant separated underneath. This indicates:

A. The lubricant has reached the end of its useful life from oxidation only

B. Normal lubricant condition for an axle approaching its service interval

C. Water contamination in the axle, likely through a failed vent or seal

D. The wrong type of lubricant was installed during the previous service

44. The MOST common cause of repeat wheel seal failures at the same wheel position is:

A. Aggressive driver braking habits that overheat the bearings repeatedly

B. Wrong torque applied to the wheel lug nuts during recent service operations

C. Incorrect lubricant grade installed during the previous wheel hub service

D. A damaged hub bore preventing proper sealing pressure on each new seal

45. Technician A says that the differential case must be removed from the carrier before pinion depth can be properly set. Technician B says pinion depth is established before the differential case is installed in the carrier. Who is correct?

A. Both Technician A and Technician B

B. Technician A only

C. Neither Technician A nor Technician B

D. Technician B only

46. A driver complains of a high-pitched whine that increases with vehicle speed and is present in every forward gear. The whine disappears when the truck shifts to neutral with the engine running. The MOST likely source is:

A. The clutch release bearing in continuous contact with pressure plate fingers

B. The drive axle ring and pinion gear set in the carrier housing assembly

C. The pilot bearing experiencing relative motion at the flywheel area

D. The transmission input shaft bearing under engine torque transmission

47. The MOST important reason for using a clutch alignment tool during heavy-duty clutch installation is to:

A. Prevent damage to the pilot bearing during the clutch installation procedure

B. Compress the cushion springs to allow easier pressure plate cover installation

C. Hold the pressure plate cover in alignment while the bolts are tightened

D. Center the clutch disc so the input shaft can pass through the hub splines

48. The standard wheel hub bolt pattern for North American Class 8 drive wheels is:

A. 10 studs on an 11.25-inch bolt circle for heavy-duty applications

B. 6 studs on a 7.25-inch bolt circle for light commercial applications

C. 8 studs on a 9.50-inch bolt circle for medium-duty applications

D. 12 studs on a 13.00-inch bolt circle for severe-duty applications

49. A heavy-duty truck has a complaint of driveline vibration that has appeared gradually over the past few months and continues to worsen. The vibration is consistent regardless of vehicle load. The MOST likely cause is:

A. Universal joint working angles changing due to suspension component wear

B. Pinion seal failure allowing oil to migrate onto the driveshaft surface

C. Driveshaft balance weights gradually loosening and shifting from original positions

D. Center support bearing rubber producing speed-specific resonance issues

50. Technician A says that a heavy-duty Class 8 tractor uses a 6x4 configuration with two driven rear axles. Technician B says that a 6x2 configuration drives both rear axles equally for improved traction. Who is correct?

A. Both Technician A and Technician B

B. Technician A only

C. Technician B only

D. Neither Technician A nor Technician B

PRACTICE EXAM 11: ANSWER KEY AND EXPLANATIONS

1. D — Internal master cylinder bypass returning fluid back to the reservoir. Fluid loss without external evidence indicates the master cylinder is leaking internally past worn seals — fluid bypasses the piston and returns to the reservoir during pedal release, then is pushed back out during the next application. Over time, the cumulative loss requires reservoir top-offs even though no external leak is visible.

2. C — Technician B only. Pressure plate cover bolts must be torqued in a cross-pattern sequence to prevent distortion of the cover. Tightening bolts in random order or sequentially around the pattern warps the cover, which in turn distorts the pressure plate's clamping geometry and produces uneven engagement.

3. B — Worn engine and transmission mounts allowing powertrain oscillation under load. Chatter that occurs only when launching with a heavy load (and not bobtail) is the classic signature of failed powertrain mounts. The heavy load amplifies the engine and transmission oscillation that worn mounts cannot control, producing visible chatter only when the load is present.

4. D — Distribute torque load across two shafts to handle higher torque capacity. The twin countershaft design splits transmitted torque between two parallel countershafts, allowing each individual gear tooth to carry approximately half the total torque. This makes higher overall torque capacity possible without requiring impractically large individual gears.

5. A — Wheel bearings or side bearings that have failed and require replacement. Growling that varies with vehicle speed and is consistent under both drive and coast conditions indicates a bearing failure (which has no drive or coast bias) rather than a gear tooth issue. Wheel bearings and side bearings both produce this pattern and must be inspected.

6. C — Driveline angles change with suspension position, and measurements must reflect operation. Driveline working angles change continuously as the suspension cycles, so measurements taken at the wrong ride height do not represent actual operating geometry. The OEM-specified ride height ensures measurements reflect the conditions the driveline experiences during normal driving.

7. B — Connect the OEM-approved scan tool to read active and stored fault codes. AMT diagnostic procedures always begin with electronic fault code retrieval before any mechanical work. The DTCs identify whether the complaint is electronic, sensor-related, mechanical, or air-supply related, directing the technician to the correct repair path.

8. D — Crush to a precise length under nut torque to set bearing preload. The collapsible spacer is engineered to deform a specific amount when the pinion nut is torqued to specification, producing exactly the right compression on the pinion bearings. Once crushed, it cannot be uncrushed — which is why it must be replaced any time the pinion nut is removed.

9. A — Tire scrub and driveline binding leading to potential component damage. Power divider lockouts engaged on dry pavement at highway speed force the forward-rear and rear-rear axles to rotate at identical speeds despite natural speed differences. The resulting binding causes severe tire scrub, driveline stress, and component damage within minutes of operation.

10. C — Both Technician A and Technician B. Non-synchronized constant-mesh transmissions traditionally require double-clutching during shifts, but skilled drivers can also perform float shifting without using the clutch by matching engine speed through throttle modulation alone. Both techniques are valid for these transmissions.

11. D — Reduce pinion shim thickness to move the pinion away from the ring gear. Toe-biased contact (toward the inner end of the tooth) indicates the pinion is set too deep in the ring gear. Reducing pinion shim thickness pulls the pinion away from the gear, shifting the contact pattern back toward the center of the tooth.

12. B — Torquing to initial specification while rotating the hub, then backing off and finalizing per OEM. Heavy-duty wheel bearing adjustment uses a torque-and-backoff procedure with specific values that vary by manufacturer. The rotation during initial torque seats the rollers properly against the races; the backoff and final setting establish the correct operating endplay or preload.

13. A — Broken clutch disc damper springs rattling against the disc hub assembly. Broken damper springs produce a rattling noise at idle that disappears when the clutch is depressed, because depressing the clutch removes torque transfer through the disc and silences the rattle source. This is the classic diagnostic signature of damper spring failure.

14. C — Soften initial clutch engagement by allowing controlled facing compression. Cushion springs are wavy washers between the friction facings that flex during initial clutch engagement, smoothing the application of torque. They differ from torsional damper springs (which absorb engine vibrations) and serve only the engagement-cushioning function.

15. B — The pinion yoke surface for grooving or wear that damages the seal lip. Repeated pinion seal failures typically trace to a worn or grooved pinion yoke surface where the seal lip rides — even a properly installed new seal cannot survive long against a damaged sealing surface. The yoke must be inspected and replaced if necessary before another seal is installed.

16. A — Misalignment of a needle bearing during cup installation causing joint binding. A displaced needle bearing trapped under the cross journal causes the new u-joint to bind during operation and fail almost immediately. This is why every u-joint installation requires verification of free cross rotation by hand before returning the driveshaft to service.

17. D — Neither Technician A nor Technician B. The descriptions are reversed: hypoid gears have the pinion offset BELOW the ring gear centerline, and amboid gears have the pinion offset ABOVE the centerline. Both technicians have the offset directions backwards.

18. C — Internal master cylinder seal failure allowing fluid bypass past the piston. A pedal that sinks slowly to the floor under sustained pressure is the classic indicator of internal master cylinder bypass. The worn seals allow fluid to leak back past the piston into the reservoir rather than maintaining pressure to the slave cylinder.

19. B — Equalize internal pressure as air expands and contracts with temperature. The transmission case vent allows internal pressure to equalize with atmospheric pressure as the lubricant heats up and cools down during operation. A blocked vent causes pressure buildup that forces oil out through seals and gaskets.

20. A — The pinion is too deep and requires reduced shim thickness behind the head. Contact biased low on the pinion teeth (near the flank) indicates the pinion is positioned too deep into the ring gear. Reducing pinion shim thickness pulls the pinion away from the ring gear, shifting the contact pattern up toward the center of the tooth face.

21. D — Inspect the fifth-gear clutching collar, mating gear, and shift fork specifically. When jumping out occurs in only one specific gear, the cause is concentrated on the components used in that gear ratio. Replacing the entire transmission for a localized issue is wasteful and unnecessary, and adjusting all detent springs ignores the actual root cause.

22. C — Inadequate lubrication during scheduled chassis service intervals routinely. Universal joints depend on regular grease lubrication to prevent needle bearing wear, and missed or inadequate chassis lubrication is the leading cause of premature u-joint failure across the industry. Speed and grease compatibility are minor factors in comparison.

23. B — Technician B only. Differential lockouts on heavy-duty axles use system air pressure routed through a cab dash switch to engage a sliding clutch in the differential case. Electric solenoid actuation is not the standard method for these heavy-duty applications.

24. A — Fatigued pressure plate springs that no longer generate full clamping force. With facings within wear limits, free travel correct, and no oil contamination, the most likely remaining cause of slippage is fatigued pressure plate springs that no longer maintain full clamping force. Springs lose tension over service life, producing slippage when high torque is demanded.

25. C — Greater than the engine's peak torque output by an application-appropriate margin. Clutch torque capacity must always exceed the engine's peak torque, with the safety margin selected based on application — modest for highway service, larger for severe-duty vocational applications. Matching exactly leaves no margin for shock loading or component aging.

26. D — Driveline working angles that change with suspension position under load. Working-angle vibration is the only driveline vibration that responds to load, because changing load alters

suspension position and therefore u-joint operating angles. Balance and runout problems produce vibration consistent with vehicle speed regardless of load condition.

27. B — Equalize internal pressure as air expands and contracts with temperature. The transmission case vent allows internal pressure to equalize with atmospheric pressure as the lubricant heats up and cools down during operation. A blocked vent causes pressure buildup that forces oil out through seals and gaskets.

28. C — Replace the thrust washers because they are below the minimum specification. The OEM minimum is an absolute limit — washers measuring 0.045 inches against a 0.050-inch minimum are below specification and must be replaced. Reinstalling sub-minimum washers allows side gears to shift axially during operation, producing noise and accelerated gear wear.

29. A — Technician A only. The inter-axle driveshaft connects the rear of the forward-rear axle's power divider to the front of the rear-rear axle's pinion yoke, carrying torque between the two drive axles. The main driveshaft (not the inter-axle driveshaft) connects the transmission to the forward-rear axle.

30. B — The bolts are torque-to-yield design and cannot be safely reused after installation. Modern heavy-duty diesel engine flywheel mounting bolts are torque-to-yield design, engineered to be installed once, stretched to a specific yield point, and replaced at any future service. Reusing these bolts can cause flywheel separation at highway speeds — a catastrophic failure mode.

31. D — The third-gear mainshaft and countershaft gear pair specifically. When transmission noise appears in only one specific gear, the cause is concentrated on the components used in that gear ratio. Gears used in other ratios do not produce noise because they are not in the loaded torque path during operation in the affected gear.

32. C — Hold the ring gear stationary while rotating the pinion through clearance. The standard backlash measurement procedure can be performed with either reference held stationary while the other is moved through clearance — both produce the same measured backlash value. Holding the ring gear and rocking the pinion is one valid technique used during backlash verification.

33. A — The rear engine main seal or transmission input shaft seal allowing leakage. Oil contamination on both faces of the clutch disc indicates oil reaching the bell housing area in significant quantity. The two most common sources are the rear engine main seal and the transmission input shaft seal — both must be inspected to identify the leak source.

34. B — Allow torque transmission to both axles while accommodating speed differences. The inter-axle differential splits driveshaft torque between the forward-rear and rear-rear axles while permitting speed differences from cornering and tire diameter variations. Without this accommodation, driveline binding would destroy components during normal operation.

35. D — Moisture in the air system freezing in the range shift valves during cold. Cold-weather-only air shift problems are the classic symptom of moisture contamination — water in the air system

freezes during cold conditions, blocking the small passages in shift valves and slowing or preventing range shift completion. The symptom resolves once temperatures rise enough to thaw the ice.

36. C — The OEM-approved scan tool for reading fault codes and live data. AMT diagnosis requires the OEM scan tool to read DTCs, monitor live actuator and sensor data during operation, and perform required calibrations after service. No mechanical tool can substitute for the electronic diagnostic capability the scan tool provides.

37. A — Center support bearing rubber mount producing speed-specific resonance. Vibration that appears at one specific speed and disappears as speed moves above or below it is the classic signature of resonance, which occurs when a deteriorated component reaches its natural frequency at a specific operating speed. The center support bearing rubber mount is the most common source of this pattern.

38. B — Accommodate axial distance changes between transmission and drive axle. As the suspension cycles, the distance between the transmission output and drive axle input changes slightly. The slip joint allows the driveshaft to lengthen and shorten through its splined connection while continuing to transmit torque through the engaged splines.

39. D — Pressure plate diaphragm spring losing tension as operating temperature increases. Heat-related slippage that appears only when the engine is hot points to a temperature-sensitive component — most commonly a pressure plate spring that loses tension as it heats up. The reduced clamping force allows slippage under load that resolves when the system cools.

40. C — Technician B only. Hypoid gears generate extreme contact pressures with significant face-sliding action that requires extreme-pressure (EP) gear oil to prevent metal-to-metal contact. Standard SAE 90 without EP additives causes rapid and catastrophic gear wear in hypoid axles.

41. A — The pinion is 0.003 inches longer than nominal, requiring reduced shim thickness. The pinion depth variation number stamped on the pinion head represents thousandths of an inch deviation from nominal length. A "+3" pinion is longer than nominal, requiring a thinner shim to position it correctly relative to the ring gear centerline.

42. B — Preserve the factory balance relationship when the driveshaft is reinstalled. A balanced driveshaft has its mass distribution matched to specific yoke orientations established at the factory. Reinstalling the driveshaft in a rotated position destroys this balance relationship and can introduce vibration that was not present before service.

43. C — Water contamination in the axle, likely through a failed vent or seal. Milky white appearance in drained gear oil is the classic visual indicator of water contamination — water emulsifies with the lubricant to produce the milky color, and the heavier oil separates underneath in the drain pan. The water source must be identified and corrected before refilling.

44. D — A damaged hub bore preventing proper sealing pressure on each new seal. When a correctly-installed seal of the correct part number repeatedly fails, the cause is typically a damaged hub bore that prevents proper sealing pressure. Continuing to install new seals without correcting the bore guarantees continued failures.

45. A — Both Technician A and Technician B. Pinion depth must be set with the differential case removed because the gauge tooling requires unobstructed access to the pinion area. The setup is established before the case is reinstalled — both statements describe the same correct sequence from different perspectives.

46. B — The drive axle ring and pinion gear set in the carrier housing assembly. A whine that varies with vehicle speed and is present in every forward gear but disappears in neutral indicates the source rotates only when the driveline is transmitting torque rearward. The ring and pinion are downstream of the transmission and produce this exact pattern.

47. D — Center the clutch disc so the input shaft can pass through the hub splines. The alignment tool keeps the disc centered relative to the pilot bearing while the cover bolts are torqued, ensuring the input shaft can pass cleanly through the disc hub when the transmission is reinstalled. Without proper alignment, the input shaft cannot mate to the disc and the splines suffer immediate damage.

48. A — 10 studs on an 11.25-inch bolt circle for heavy-duty applications. The 10-on-11.25 pattern is the dominant standard for North American Class 8 drive wheels and applies to virtually all heavy-duty applications. Knowing the standard helps a technician verify wheel-to-hub compatibility during service.

49. C — Driveshaft balance weights gradually loosening and shifting from original positions. Vibration that develops gradually over months without load sensitivity is typical of progressive imbalance — balance weights working loose, accumulated debris on the shaft, or other slow changes to the mass distribution. Working-angle issues respond to load, ruling out that cause.

50. B — Technician A only. A 6x4 configuration uses six total wheel positions with both rear axles powered, making it the standard linehaul Class 8 configuration. The 6x2 configuration powers only one of the two rear axles, sacrificing some traction for improved fuel economy and reduced tire wear — Technician B has this backwards.