PRACTICE EXAM 11: ASE T2 SIMULATION

DOMAIN A — GENERAL ENGINE DIAGNOSIS (Questions 1–11)

1. A Class 8 tractor driver reports that his engine produces a loud knock that appears only during hard acceleration on grades. The knock disappears at steady cruise. The technician should FIRST:

A. Replace the fuel filter

B. Adjust all valve lash

C. Change the engine oil

D. Verify the complaint under the specific load conditions described

2. A heavy-duty diesel has active DTCs for low boost and elevated back pressure. During the road test, both conditions are confirmed. The fault is MOST likely located in the:

A. Aftertreatment system restricting exhaust flow

B. Fuel injection system

C. Cylinder head assembly

D. Charge air cooler fins

3. Oil analysis on a fleet engine shows sodium rising sharply over two consecutive samples. Iron and copper remain normal. This pattern points to:

A. Piston ring wear

B. Coolant additive package entering the oil

C. Dirt ingestion through the intake

D. Normal oil aging

4. Technician A says cylinder contribution data identifies weak cylinders. Technician B says compression testing distinguishes between fuel delivery faults and mechanical faults. Who is correct?

A. Technician A only

B. Neither Technician A nor Technician B

C. Technician B only

D. Both Technician A and Technician B

5. A scan tool snapshot captured when a DTC set shows engine parameters at the moment of the fault. This data is called:

A. Adaptive values

B. Readiness monitors

C. Freeze frame data

D. Long-term fuel trim

6. A heavy-duty diesel produces a ticking noise from the valve cover area, loudest at idle and persisting at operating temperature. The MOST likely cause is:

A. Excessive valve lash

B. Rod bearing knock

C. Turbocharger bearing wear

D. Normal combustion noise

7. A driver complains of "smoke from the tailpipe" during heavy acceleration. The smoke is black. The engine is a pre-emissions design with no DPF. Black smoke under these conditions indicates:

A. Normal cold start

B. Overfueling relative to available air

C. Excessive coolant consumption

D. Low battery voltage

8. An engine ECM shows a stored DTC but no active fault. The technician should:

A. Clear the code and return the truck

B. Replace the ECM

C. Read freeze frame data and diagnose the condition that set the code

D. Disconnect the batteries overnight

9. Oil analysis shows silicon elevated from 12 to 78 ppm between samples. Iron remains normal. The MOST likely cause is:

A. Normal additive depletion

B. Excessive wear metals

C. Coolant contamination

D. Dirt ingestion through an intake leak

10. A cylinder cutout test shows one cylinder produces no measurable RPM drop when disabled. This indicates:

A. The cylinder is not contributing

B. The cylinder is producing full power

C. Normal variation between cylinders

D. The scan tool is malfunctioning

11. A Class 8 tractor has been derated to 5 mph. The dash displays an inducement timer countdown. The MOST likely cause is:

A. Low engine oil level

B. A persistent emissions fault in SCR or DEF system

C. Low fuel level

D. AC system malfunction

DOMAIN B — CYLINDER HEAD AND VALVE TRAIN (Questions 12–15)

12. A valve margin on an exhaust valve measures 0.048 inches. Specification minimum is 0.060 inches. The correct action is:

A. Replace the valve

B. Regrind the face

C. Install a shim

D. Reinstall and monitor

13. Head bolts on a modern heavy-duty diesel are almost always:

A. Standard reusable fasteners

B. Hand-tightened studs

C. Torque-to-yield bolts requiring replacement

D. Self-locking bolts

14. A worn camshaft lobe is found during rebuild. Before installing the replacement cam, the technician must:

A. Install oversize bearings

B. Reduce engine operating RPM

C. Replace the crankshaft

D. Identify and correct the oil supply or follower problem that caused the wear

15. Valve lash specifications for exhaust valves are typically larger than intake because:

A. Intake valves are smaller

B. Exhaust valves experience higher thermal expansion

C. Intake valves are electronically controlled

D. Exhaust valves close slower

DOMAIN C — ENGINE BLOCK (Questions 16–20)

16. A cylinder liner protrusion reading of 0.005 inches uniformly around the circumference meets the 0.001–0.006 inch specification. The correct action is:

A. Proceed with head installation

B. Remove and reinstall the liner

C. Add shims to increase protrusion

D. Replace the liner

17. A connecting rod with a bent condition has been identified. Before installing the replacement rod:

A. Replace the crankshaft

B. Install oversize bearings

C. Increase oil pressure

D. Investigate what caused the original rod to bend

18. Engine block deck flatness is measured with:

A. A caliper only

B. Hand feel along the surface

C. A precision straightedge and feeler gauges

D. A ruler and paper

19. Out-of-round on a crankshaft main journal is the difference between:

A. Perpendicular diameter measurements at the same axial position

B. Journal length and diameter

C. Journal diameter and bearing diameter

D. Axial measurements at the same angle

20. A forged steel monobloc piston is preferred for heavy-duty diesel service because:

A. It is less expensive to produce

B. It provides superior thermal durability at the crown

C. It is lighter than aluminum

D. It is easier to install

DOMAIN D — LUBRICATION AND COOLING (Questions 21–26)

21. An oil filter bypass valve opens at 25 psi differential during warm operation. This indicates:

A. Normal operation at idle

B. Excessive oil pressure

C. Low oil viscosity

D. A plugged filter restricting flow

22. A coolant pressure test shows pressure dropping from 15 psi to 8 psi over 10 minutes with no visible external leak. The MOST likely cause is:

A. A failed pressure cap

B. Normal coolant expansion

C. An internal leak into combustion or crankcase

D. Loose radiator hose clamps

23. Supplemental coolant additive (SCA) primarily replenishes:

A. Nitrite-based cavitation inhibitors

B. Ethylene glycol for freeze protection

C. Coolant dye for visibility

D. Water pump lubricant

24. Oil cooler internal leak with oil pressure exceeding coolant pressure will produce:

A. Clean coolant appearance

B. Fuel in the oil

C. Immediate engine seizure

D. Brown emulsion in the coolant surge tank

25. Engine oil viscosity of 15W-40 means:

A. Single-grade oil for winter use

B. Multigrade oil with cold-flow and operating viscosity characteristics

C. Synthetic oil only

D. Low-temperature specialty oil

26. A fan clutch on a heavy-duty diesel should engage when:

A. The engine reaches idle speed

B. The AC system activates

C. Coolant or charge air temperature reaches threshold

D. The clutch pedal is depressed

DOMAIN E — AIR INDUCTION AND EXHAUST (Questions 27–32)

27. An air intake leak between the filter and turbocharger allows:

A. Unfiltered air to erode compressor blades

B. Coolant into the intake

C. Oil into the combustion chamber

D. Exhaust gas into the intake

28. A VGT stuck in the fully open position produces:

A. Overboost at all speeds

B. Normal boost at low RPM

C. Improved fuel economy

D. Low boost at low RPM with poor throttle response

29. Charge air cooler internal oil contamination typically comes from:

A. EGR cooler leakage

B. Failed turbocharger compressor-side seal

C. Head gasket failure

D. Worn piston rings

30. Exhaust back pressure at rated load should normally be less than:

A. 15 psi

B. 25 psi

C. 3 to 5 psi

D. 10 psi

31. Active DPF regeneration is commanded when:

A. The engine reaches idle

B. Exhaust temperature drops below freezing

C. Ambient temperature exceeds 100°F

D. Accumulated DPF soot load exceeds the passive regeneration threshold

32. An EGR valve stuck closed will produce:

A. Elevated NOx emissions and aftertreatment faults

B. Improved fuel economy

C. Excessive coolant consumption

D. Reduced exhaust back pressure

DOMAIN F — FUEL SYSTEM (Questions 33–48)

33. A heavy-duty diesel HPCR system shows rail pressure building only to 12,000 psi during commanded 26,000 psi. Lift pump output reads 28 psi (spec 45–60). The MOST likely cause is:

A. Failed rail pressure sensor

B. Inadequate low-pressure supply

C. Worn camshaft lobe

D. Failed injector driver circuit

34. Technician A says EUI systems generate injection pressure through a cam-driven plunger in each injector. Technician B says HEUI systems use high-pressure engine oil on a hydraulic intensifier. 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

35. A water-in-fuel warning illuminates. The correct response is:

A. Drain the water from the separator bowl

B. Replace the fuel filter

C. Add fuel additive

D. Clear the warning and continue

36. Lift pump output measured at 22 psi (spec 45–60). Before condemning the pump, the technician should:

A. Replace the secondary filter

B. Replace the HP pump

C. Replace all injectors

D. Check upstream restrictions in the primary filter and water separator

37. HPCR injector calibration codes must be programmed into the ECM because:

A. The ECM verifies warranty status

B. The ECM compensates for individual injector flow characteristics

C. The codes activate the injector electronically

D. The codes prevent theft

38. A pilot injection event on an HPCR engine delivers approximately:

A. 30 percent of total cycle fuel

B. 50 percent of total cycle fuel

C. 2 to 5 percent of total cycle fuel

D. 85 percent of total cycle fuel

39. A diesel fuel with a cloud point of 18°F operated in a climate reaching -10°F will:

A. Form wax crystals that plug fuel filters

B. Boil in the injection pump

C. Increase cetane rating

D. Improve cold-start performance

40. An injector return flow test shows one injector returning 45 mL/min while others return 15 mL/min. This indicates:

A. Normal variation

B. A plugged return line

C. Under-fueling condition

D. Excessive internal injector leakage

41. On an HEUI system, the ICP (Injection Control Pressure) sensor monitors:

A. Fuel rail pressure

B. High-pressure engine oil supplied to injectors

C. Battery voltage

D. Coolant pressure

42. Biodiesel B20 introduced to a diesel engine previously running petroleum diesel may cause:

A. Improved cetane rating

B. Reduced emissions only

C. Premature filter plugging from dissolved deposits

D. Increased fuel economy

43. The primary fuel filter on a heavy-duty diesel filters at approximately:

A. 2 to 4 microns

B. 100 microns

C. 1 micron

D. 10 to 30 microns nominal

44. An HPCR pressure control valve stuck closed will cause:

A. Rail pressure to climb to HP pump maximum

B. Reduced rail pressure

C. Normal operation

D. Excess fuel in the return line

45. A fuel pressure regulator on the return line maintains supply pressure by:

A. Opening when temperature rises

B. Restricting return flow when pressure drops below target

C. Filtering debris from return fuel

D. Measuring return flow rate

46. An EUI injector requires:

A. Compressed brake air

B. Coolant flow through the injector

C. High-pressure oil from a rail

D. Cam-driven plunger motion with ECM solenoid control

47. A heavy-duty diesel fuel tank vent blocked by debris will:

A. Improve fuel economy

B. Progressively starve the engine as tank vacuum develops

C. Have no effect

D. Increase fuel pressure

48. On a common rail system, which component physically stores pressurized fuel between injection events?

A. The high-pressure pump

B. Each injector internally

C. The common rail acting as a pressure accumulator

D. The pressure control valve

DOMAIN G — STARTING AND CHARGING (Questions 49–52)

49. A heavy-duty diesel cranks slowly. Battery open-circuit voltage reads 12.4V. Voltage drop across the positive cable during cranking reads 1.1V (spec 0.5V max). The MOST likely cause is:

A. Excessive resistance in the cable or terminals

B. A failed starter motor

C. A discharged battery pack

D. A failed alternator

50. A charging system test shows 14.1V at idle with no load. Under 200-amp load, voltage drops to 13.4V. At 1,500 RPM with load, voltage returns to 13.8V. This indicates:

A. A failed regulator

B. A shorted rotor

C. Normal operation within alternator output capacity

D. A slipping drive belt

51. A starter motor armature spins but does not crank the engine. The MOST likely cause is:

A. A discharged battery

B. A worn starter drive or pinion

C. Failed voltage regulator

D. Blown starter fuse

52. An AC ripple measurement on alternator output reads 800 mV at rated output. Specification is below 100 mV. The MOST likely cause is:

A. Slipping drive belt

B. Failed voltage regulator

C. One or more failed rectifier diodes

D. Discharged battery

DOMAIN H — ENGINE BRAKES (Questions 53–55)

53. A compression-release engine brake produces braking effort by:

A. Opening the exhaust valve near the end of compression to release compressed air

B. Closing the exhaust valve to increase cylinder pressure

C. Grounding the ignition system

D. Increasing fuel injection during deceleration

54. An exhaust brake operates by:

A. Activating the alternator

B. A butterfly valve restricting exhaust flow

C. Opening exhaust valves near TDC

D. Reducing fuel injection

55. Compression-release engine brake lash is adjusted:

A. Before valve lash

B. Using the same feeler gauge as valve lash

C. Only during complete engine rebuild

D. After valve lash with a different specification

PRACTICE EXAM 11: ANSWER KEY AND EXPLANATIONS

1. D — Verifying the complaint under the exact conditions described is always the first diagnostic step. Knocks specific to hard acceleration on grades must be confirmed during that load condition, not during idle or cruise. Without verification, technicians may address conditions that don't actually match the customer's complaint.

2. A — Low boost combined with elevated back pressure points directly to the aftertreatment system restricting exhaust flow. The restriction prevents the turbine from developing rated speed, so boost falls short while back pressure rises. This signature pattern is specifically diagnostic of aftertreatment-side restriction.

3. B — Sodium, potassium, and boron together are the signature elements of heavy-duty coolant additive packages. A sharp rise in sodium specifically, without wear metal elevation, indicates coolant chemistry is entering the engine oil. The typical source is a head gasket, cracked casting, or oil cooler failure.

4. D — Both technicians are correct. Cylinder contribution data identifies weak cylinders by showing which ones produce less power than expected. Compression testing then distinguishes fuel delivery faults (where compression is normal) from mechanical faults (where compression is low), guiding targeted repair.

5. C — Freeze frame data is the scan tool capture that records engine parameters at the exact moment a DTC was first detected. RPM, load, temperatures, and pressures at the time of the fault provide the context needed to understand under what conditions the problem occurred.

6. A — Ticking noise loudest at idle that persists at operating temperature is the classic signature of excessive valve lash. The impact between the rocker arm and valve stem produces rhythmic tapping that does not diminish with warmup. Rod knock is deeper and load-dependent; turbo bearing noise is a whine.

7. B — Black smoke under hard acceleration on a pre-emissions diesel indicates overfueling relative to available air. Either too much fuel is being delivered or insufficient air is reaching the cylinders. Intake restrictions, worn turbochargers, or injector problems all produce this air-fuel imbalance.

8. C — A stored DTC without an active fault means the condition occurred at some point and may recur. Reading freeze frame data and diagnosing the original condition prevents future occurrence. Clearing the code without diagnosis only resets the record; the underlying issue remains unaddressed.

9. D — Silicon jumping from 12 to 78 ppm with iron remaining normal indicates external dirt is entering the engine without yet causing significant internal wear. The most common source is an air intake leak allowing unfiltered dust past the filter. Repair prevents progression to internal wear metal elevation.

10. A — A cylinder producing no measurable RPM drop when cut out was not contributing before cutout. If it had been firing normally, disabling it would have produced a measurable drop in engine speed. The absence of change indicates the cylinder is effectively already off — fuel delivery, mechanical, or both.

11. B — Inducement timer countdown on a derated Class 8 tractor is specifically an emissions-related condition. The ECM has detected a persistent fault in the SCR or DEF system and is enforcing progressive derate per EPA requirements. Other listed conditions do not trigger inducement timers.

12. A — A valve margin at 0.048 inches below the 0.060-inch minimum cannot reliably transfer combustion heat and will burn in service. Grinding removes more material and worsens the condition. Shims and monitoring do not address the underlying heat transfer deficiency.

13. C — Modern heavy-duty diesel head bolts are almost universally torque-to-yield (TTY) fasteners. They are stretched past their yield point during installation to provide consistent clamping force. Once stretched, they cannot reliably produce proper clamp load on reuse, so OEMs require replacement.

14. D — Cam lobe wear is almost always a symptom of an upstream problem: inadequate oil supply to that location or a failing follower. Installing a new cam without identifying and correcting the cause guarantees the replacement will wear in the same pattern. Root cause must be addressed first.

15. B — Exhaust valves operate at significantly higher temperatures than intake valves because they are exposed to hot combustion gases. The greater thermal expansion requires larger cold-lash clearance so the valve can still seat properly at operating temperature. Intake valve size and electronic control are not factors in lash specification.

16. A — Uniform protrusion of 0.005 inches around the circumference meets the 0.001–0.006 inch specification with no variation concern. The liner is correctly installed and ready for head installation. Removal, shims, or replacement are unnecessary when measurements meet spec with uniform readings.

17. D — Bent rods are typically symptoms of upstream events such as hydrolock, detonation, or severe cylinder pressure spikes. Installing a replacement rod without identifying the cause of the original bending guarantees repeat failure. Investigation must precede replacement to prevent immediate re-failure.

18. C — Block deck flatness requires a precision straightedge placed across the deck surface, with feeler gauges measuring any gap. This technique identifies warp in multiple orientations —

longitudinal, transverse, and diagonal. Calipers, hand feel, and rulers cannot accurately measure flatness.

19. A — Out-of-round is specifically the difference between diameter measurements taken at perpendicular angles (typically 90°) at the same axial position. This measures cross-sectional shape distortion. Taper is the separate axial measurement; journal length and bearing comparisons are unrelated parameters.

20. B — Forged steel monobloc pistons provide superior thermal durability at the crown, surviving combustion chamber temperatures that cast aluminum cannot sustain. Heavy-duty diesels operate with crown temperatures often exceeding 900°F at rated load. Cost, weight, and assembly difficulty favor other designs, but thermal performance demands forged steel.

21. D — An oil filter bypass valve opens at its design differential pressure when the filter's restriction becomes excessive. During warm operation, this indicates the filter has become plugged with contamination and flow is restricted. Filter replacement is required before further contamination damage occurs.

22. C — Pressure loss with no external leak indicates internal leakage into the combustion chamber or crankcase. Head gasket failure and cracked head/block are the two primary paths. Combustion leak testing can confirm which internal path is losing coolant, guiding the specific repair needed.

23. A — SCA is a nitrite-based additive that replenishes the cavitation inhibitor chemistry in heavy-duty coolants. Cavitation damage occurs on cylinder liner outer surfaces from coolant bubble collapse during cylinder flex. Without nitrite, this attack progresses unchecked and destroys liners.

24. D — Oil pressure normally exceeds coolant pressure, so internal oil cooler leaks flow from high-pressure oil to lower-pressure coolant. The brown emulsion visible in the surge tank is the classic signature of this failure. Opposite direction flow would produce coolant in oil.

25. B — 15W-40 is a multigrade oil with two separate viscosity characteristics: 15W cold-flow capability for winter startup and SAE 40 operating-temperature viscosity for full protection under load. Multigrade formulations provide service across temperature ranges that single-grade oils cannot match.

26. C — Fan clutch engagement is triggered by thermal conditions — either coolant temperature or charge air temperature reaching the specified threshold. The ECM monitors these parameters and commands clutch engagement when cooling demand rises. Idle speed, AC activation, and clutch pedal operation are not engagement triggers.

27. A — An air intake leak between the filter and turbocharger admits unfiltered dust directly to the compressor wheel. Abrasive particles erode the compressor blade leading edges and damage bearings, eventually destroying the turbocharger. This location has no secondary filtration to catch contamination.

28. D — A VGT stuck fully open cannot accelerate exhaust gas onto the turbine at low RPM. Without vane closure, low-speed boost cannot develop — producing low boost at low engine speed, reduced low-end torque, and poor throttle response. High-RPM operation may produce some boost but inefficiently.

29. B — Failed turbocharger compressor-side seals are the primary source of oil contamination in the charge air cooler. Oil leaks past the seal into the pressurized intake path and deposits on CAC internal surfaces. EGR coolers introduce coolant, not oil, and head gaskets don't typically route oil to the CAC.

30. C — Normal exhaust back pressure at rated load on a heavy-duty diesel is 3 to 5 psi maximum. Above this range indicates restriction somewhere in the exhaust system. The specification provides the threshold for diagnosis of aftertreatment or exhaust path issues.

31. D — Active regeneration is commanded when accumulated DPF soot exceeds the threshold that passive regeneration can clear. The ECM then initiates fuel dosing to raise DPF temperature high enough to burn off soot. Engine speed, ambient temperature, and freezing conditions are not the primary triggers.

32. A — A stuck-closed EGR valve prevents exhaust recirculation, eliminating the charge dilution that reduces peak combustion temperature. Without this dilution, NOx production rises significantly, overwhelming SCR capacity and triggering aftertreatment efficiency faults and potential derate.

33. B — Lift pump output at 28 psi (well below 45–60 spec) means the HP pump cannot receive adequate supply to build rated rail pressure. The low-pressure supply fault must be addressed first; HP components cannot be evaluated until supply is confirmed adequate.

34. C — Both technicians are correct. EUI injectors generate pressure through cam-driven plunger action inside each injector. HEUI injectors use high-pressure engine oil acting on a hydraulic intensifier inside each injector. These are the defining characteristics that distinguish these injection technologies.

35. A — A water-in-fuel warning indicates water has accumulated in the separator bowl to the sensor level. Draining via the manual drain valve releases the water and should clear the warning. This is standard maintenance; replacing filter or adding additives does not address accumulated water.

36. D — Before condemning the lift pump, upstream restrictions must be ruled out. A restricted primary filter or water separator reduces pump output even with a healthy pump. Checking upstream first prevents unnecessary lift pump replacement when the actual fault is a restricted filter.

37. B — HPCR injector calibration codes encode each injector's unique factory flow characteristics. The ECM uses this code to compensate for individual injector variation, ensuring balanced cylinder delivery. Without coding, cylinder contribution imbalance and emissions faults occur.

38. C — Pilot injection delivers a small quantity of fuel — typically 2 to 5 percent of total cycle fuel. The small volume initiates combustion early, raising chamber pressure and temperature to reduce ignition delay on the main event. Main injection delivers the majority (65–85%) of cycle fuel.

39. A — Fuel with a cloud point of 18°F will form wax crystals at any temperature below that value. In a -10°F climate, the wax plugs fuel filters during cold operation. Anti-gel additives or winter blending are required to prevent operational problems at low ambient temperatures.

40. D — Return flow of 45 mL/min versus 15 mL/min on other injectors represents three times normal leakage. This indicates excessive internal leakage past worn plungers or control valves — rail pressure escapes through the return path rather than being delivered as injection. Injector service or replacement is needed.

41. B — On HEUI systems, injection pressure is generated by high-pressure engine oil acting on each injector's hydraulic intensifier. The ICP sensor monitors this oil pressure and provides feedback to the ECM's pressure control loop — analogous to the rail pressure sensor on HPCR systems but measuring oil, not fuel.

42. C — Biodiesel acts as a solvent and dissolves accumulated deposits in fuel tanks, lines, and filters. When switching to B20, these deposits flush through and collect in the fuel filter, producing premature plugging. Filter intervals should be reduced during transition to prevent starvation.

43. D — Primary fuel filters on heavy-duty diesels filter at 10 to 30 microns nominal. This range handles significant contamination at high flow rates. The finer secondary filter (2–4 microns) provides final protection for high-pressure components; the primary does initial capture.

44. A — A pressure control valve stuck closed cannot bleed excess rail pressure. The HP pump continues pumping until reaching its maximum output capacity, far exceeding the commanded pressure. The ECM typically detects this overpressure condition and triggers protective derate.

45. B — A fuel pressure regulator maintains commanded supply pressure by restricting return flow when pressure falls below target. As supply pressure drops, the regulator closes partially, reducing return flow and allowing pressure to build. Above target, the regulator opens to bleed excess.

46. D — EUI injectors require cam-driven plunger motion to generate injection pressure internally. ECM solenoid control determines timing and duration of the injection event. This combination distinguishes EUI from HEUI (oil pressure) and HPCR (stored rail pressure) injection systems.

47. B — A blocked tank vent prevents atmospheric air from entering as fuel is drawn out. Vacuum progressively develops in the tank, opposing fuel flow through the pickup. The engine may run at low demand initially, but the vacuum eventually starves the engine under load.

48. C — The common rail is the pressurized accumulator that stores fuel between injection events. The HP pump maintains rail pressure; each injector releases stored pressure when commanded. Individual injectors do not store fuel internally; the rail is the central pressure reservoir.

49. A — Cable voltage drop of 1.1V (against 0.5V max) indicates excessive resistance in the positive cable or its terminal connections. Battery voltage is adequate at 12.4V, so the fault is not battery-related. The resistance is restricting current flow to the starter.

50. C — The charging system is functioning within normal capacity. At high load with the engine at idle, alternator output is limited by low RPM; as RPM rises, output capacity increases and voltage returns to the regulated value. This behavior reflects normal alternator output characteristics.

51. B — When the starter armature spins but does not crank the engine, the drive mechanism has failed. The pinion or Bendix drive is worn or damaged and cannot transfer rotation to the flywheel ring gear. Battery voltage, regulator, and fuse issues would prevent armature rotation, not just engagement.

52. C — AC ripple eight times above specification is the classic signature of failed rectifier diodes. Each failed diode allows AC to pass through to the DC output. Elevated ripple damages sensitive electronics throughout the vehicle, especially ECM circuits. Belt slip, regulator failure, and discharged batteries produce different symptoms.

53. A — Compression-release engine brakes produce braking effort by opening the exhaust valve near the end of the compression stroke. The compressed air is released into the exhaust before it can return energy to the piston. The engine absorbs drivetrain energy rather than producing power.

54. B — Exhaust brakes use a butterfly valve in the exhaust piping to restrict flow. The restriction creates back pressure the piston must pump against during the exhaust stroke, absorbing drivetrain energy as pumping losses. The mechanism is simpler than compression-release brakes but generally produces less braking power.

55. D — Engine brake lash is adjusted after valve lash is set correctly, using a different feeler gauge specification and a distinct procedure. Valve lash establishes the baseline geometry from which brake lash is measured. Both adjustments are required, but they are separate steps with different specifications.