

PRACTICE EXAM 5: T3 SIMULATION

(40 QUESTIONS)

DOMAIN A — CLUTCH (Questions 1–11)

1. Technician A says the proper torque sequence for heavy-duty clutch pressure plate bolts builds in stages from approximately 25 ft-lbs to final specification. Technician B says heavy-duty pressure plate bolts can be torqued to maximum specification in a single pass without component damage. Who is correct?

- A. Both Technician A and Technician B
- B. Technician B only
- C. Technician A only
- D. Neither Technician A nor Technician B

2. The flywheel runout specification on most heavy-duty diesel applications must not exceed approximately:

- A. 0.005 inches measured at the friction surface during inspection
- B. 0.050 inches measured at the friction surface during inspection
- C. 0.100 inches measured at the friction surface during inspection
- D. 0.250 inches measured at the friction surface during inspection

3. The proper procedure for measuring flywheel surface runout is to:

- A. Apply battery voltage to the flywheel for diagnostic testing during inspection
- B. Mount a dial indicator on a fixed reference and rotate the flywheel slowly

- C. Listen for runout-related noise with a stethoscope at idle conditions
- D. Estimate runout visually using shop lighting during the inspection process

4. All of the following are direct causes of clutch chatter EXCEPT:

- A. Oil contamination on the clutch friction surfaces from a leak
- B. Glazed clutch facings combined with minor flywheel surface variation
- C. Damaged or weakened pressure plate springs reducing clamping evenly
- D. Excessive transmission fluid level above the maximum fill mark indication

5. A heavy-duty clutch master cylinder reservoir shows fluid contamination with debris and discoloration. The proper service action is:

- A. Flush the system completely and replace the master and slave cylinders
- B. Continue operation since fluid contamination has minimal effect on operation
- C. Add fresh fluid to dilute the contamination during normal service intervals
- D. Apply battery voltage to the cylinders for diagnostic testing during service

6. Technician A says heavy-duty clutch fluid is typically DOT 3 brake fluid. Technician B says heavy-duty clutch fluid specifications vary by manufacturer and must be verified before service. Who is correct?

- A. Technician A only
- B. Neither Technician A nor Technician B
- C. Both Technician A and Technician B
- D. Technician B only

7. The maximum allowable clutch facing wear before replacement is typically expressed as:

- A. A percentage of the original disc thickness with no specific dimension
- B. A specified minimum thickness measured from the disc surface to rivet heads
- C. Visual inspection only without specific measurement requirements
- D. A fixed mileage value regardless of remaining facing material

8. The proper way to verify whether a clutch chatter complaint is caused by oil contamination versus glazing is to:

- A. Apply battery voltage to the assembly for diagnostic testing during service
- B. Listen for the chatter pattern with a stethoscope at idle conditions
- C. Test drive the vehicle through multiple temperature ranges before disassembly
- D. Inspect the disc and flywheel surfaces after clutch removal during service

9. The clutch release fork pivot point on a heavy-duty truck typically requires:

- A. Periodic lubrication during normal preventive maintenance service
- B. No service throughout the clutch component service life
- C. Replacement at every clutch assembly service regardless of condition
- D. Application of battery voltage for diagnostic testing during service

10. The most accurate description of clutch disc cushioning between the friction facings is:

- A. Solid steel plate construction without internal flexibility for engagement
- B. Wave-shaped marcel spring that compresses progressively during engagement
- C. Hydraulic damper that absorbs torque variations during normal operation

D. Pneumatic chamber that pressurizes during clutch engagement procedures

11. The proper procedure when a heavy-duty clutch shows oil contamination on the friction surfaces is:

- A. Identify and repair the oil source, then replace the clutch components
- B. Clean the friction surfaces with brake cleaner and reinstall the assembly
- C. Continue operation since oil contamination clears with extended use
- D. Apply battery voltage to the clutch components for diagnostic testing

DOMAIN B — TRANSMISSION (Questions 12–24)

12. The countershaft thrust bearing on a heavy-duty manual transmission is most directly responsible for:

- A. Engaging gear sets during shift events during normal operation
- B. Controlling axial movement of the countershaft during operation
- C. Synchronizing input shaft speed to output shaft speed during shifts
- D. Lubricating the gear teeth during normal operation conditions

13. Technician A says heavy-duty manual transmission lubricant breaks down primarily from contamination by water and metal particles. Technician B says heavy-duty manual transmission lubricant breaks down primarily from heat-related thermal degradation only. Who is correct?

- A. Both Technician A and Technician B
- B. Technician B only
- C. Neither Technician A nor Technician B
- D. Technician A only

14. The proper diagnostic priority when a heavy-duty AMT sets a fault for clutch position sensor is:

- A. Verify sensor signal with scan tool, then inspect wiring and mechanical actuator condition
- B. Replace the sensor immediately as the most likely failure component
- C. Replace the entire clutch actuator assembly during the same service event
- D. Apply battery voltage to the sensor terminals for diagnostic verification

15. A heavy-duty manual transmission output shaft thrust play measured at 0.030 inches indicates:

- A. Normal clearance within manufacturer specification limits for the application
- B. Insufficient clearance requiring removal of thrust washers during service
- C. Excessive clearance requiring service to identify the cause and correct
- D. Wheel bearing failure on the affected side of the rear drive axle

16. The proper torque procedure for a heavy-duty transmission countershaft retaining nut is to:

- A. Apply maximum specification torque in a single pass without verification
- B. Use specified torque value with anti-rotation tool to hold the shaft
- C. Estimate torque using a standard ratchet without measurement equipment
- D. Apply anti-seize compound and use minimum specification during service

17. The most accurate description of an Eaton Fuller 13-speed transmission gear pattern is:

- A. Five-speed direct-drive with synchronized splitter ratios in all positions
- B. Six-speed main case with high range only and no splitter capability
- C. Three-speed main case with quad-range auxiliary section design
- D. Five-speed main case with high/low range and splitter in high range

18. Technician A says the fifth wheel air shift system shares pneumatic supply with the transmission range and splitter shifts. Technician B says the transmission pneumatic supply must be completely independent from all other truck pneumatic systems. 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

19. A heavy-duty manual transmission produces normal noise in all gears except fifth, which produces a distinct grinding sound under load. The most likely cause is:

- A. A failed clutch brake at the input shaft splines area
- B. Worn input shaft bearing affected by load conditions
- C. Damaged gear teeth on the fifth gear set in the transmission
- D. Insufficient lubricant level affecting all gear operations equally

20. The proper inspection procedure for a heavy-duty transmission case during rebuild includes verification of:

- A. External paint condition and fastener appearance during the inspection
- B. Engine compatibility with the transmission case during the procedure
- C. Vehicle type compatibility with the transmission application
- D. Bore conditions, mating surfaces, and bolt thread integrity throughout

21. The shift bar housing on a heavy-duty manual transmission contains:

- A. The main case lubricant during normal operating conditions

- B. The auxiliary section gears during high range engagement only
- C. The clutch release components during normal operation
- D. The shift rails, forks, detent springs, and interlock components

22. The progression of damage from operating with insufficient transmission lubricant for an extended period typically follows:

- A. Bearing wear, then gear tooth damage, then catastrophic transmission failure
- B. Sudden gear failure with no warning during normal vehicle operation
- C. Loss of all forward gears simultaneously requiring immediate service
- D. External case warpage requiring complete transmission replacement immediately

23. The proper way to verify AMT clutch actuator stroke is to:

- A. Replace the actuator regardless of condition during the service procedure
- B. Listen for actuator operation with a stethoscope during operation
- C. Use scan tool to monitor actuator position during commanded clutch operation
- D. Apply battery voltage to the actuator for diagnostic testing during service

24. The LEAST likely cause of a heavy-duty manual transmission that grinds when shifting from neutral into reverse with the truck stopped is:

- A. The clutch brake worn beyond service specification limits during operation
- B. A failed coolant temperature sensor reading falsely cold to the engine ECM
- C. The clutch brake out of adjustment preventing proper input shaft stop
- D. The clutch failing to fully release allowing input shaft rotation during shift

DOMAIN C — DRIVESHAFT AND U-JOINTS (Questions 25–31)

25. The minimum acceptable U-joint condition for return to service is:

- A. Any condition that allows the joint to rotate without immediate failure
- B. Visual condition only without functional verification during inspection
- C. Smooth rotation with detectable play within manufacturer tolerance limits
- D. No detectable play with smooth rotation through the full operating range

26. A heavy-duty driveshaft with bearing caps secured by U-bolts requires torque application:

- A. To specification using a calibrated torque wrench at the U-bolt nuts
- B. To maximum value possible using a standard ratchet during installation
- C. Estimated visually based on threading depth into the yoke during install
- D. After applying anti-seize compound to all threading during installation

27. The proper service action when a U-joint shows surface rust on the bearing caps but no detectable play is:

- A. Replace the U-joint immediately as preventive maintenance procedure
- B. Apply anti-seize compound to the bearing caps to prevent further rust
- C. Continue service if functional, with monitoring during routine inspections
- D. Listen for U-joint noise with a stethoscope at idle during operation

28. Technician A says driveshaft phasing is verified by aligning reference marks on the driveshaft yokes during installation. Technician B says driveshaft phasing requires complete driveshaft balancing equipment for verification. Who is correct?

- A. Both Technician A and Technician B
- B. Technician A only
- C. Technician C only
- D. Neither Technician A nor Technician B

29. The most accurate description of a constant velocity (CV) joint in heavy-duty truck applications is:

- A. Standard equipment on all heavy-duty highway truck driveshafts during manufacture
- B. A standard component used during normal preventive maintenance service
- C. A clutch-type coupling that allows differential action between front and rear
- D. A specialized joint used in select applications where U-joint angles cannot be matched

30. A heavy-duty driveshaft requires removal for service. The proper procedure includes:

- A. Mark the front and rear yoke positions, remove fasteners, then remove the assembly
- B. Disconnect the front yoke first without marking any reference positions
- C. Mark the orientation, support the assembly properly, remove fasteners systematically
- D. Apply battery voltage to the components during the removal procedure

31. The proper inspection of a slip joint during driveshaft service includes:

- A. Verification of spline condition, lubrication state, and freedom of axial movement
- B. Visual inspection only without functional verification during the inspection
- C. Replacement as preventive maintenance procedure regardless of condition

D. Listen for slip joint operation with a stethoscope during normal operation

DOMAIN D — DRIVE AXLE (Questions 32–40)

32. The pinion bearing preload on a heavy-duty drive axle is established through:

- A. Application of standardized torque values on the pinion nut for the application
- B. Visual inspection of bearing seating during the installation procedure
- C. A combination of crush sleeve compression or shim selection per service spec
- D. Apply battery voltage to the bearings for diagnostic testing during installation

33. Technician A says heavy-duty drive axle ring and pinion gear sets typically use hypoid tooth designs. Technician B says drive axle ring and pinion gear sets typically use straight-cut spur gears for maximum torque transmission. 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

34. The proper service action when a drive axle differential cover gasket shows minor weeping after normal service is:

- A. Continue operation since minor leakage has minimal effect on differential function
- B. Apply additional gasket sealer to the gasket without removing the cover
- C. Apply battery voltage to the differential housing for diagnostic testing
- D. Drain the gear oil, remove the cover, replace the gasket, and refill with proper oil

35. The most accurate description of a heavy-duty drive axle differential cross shaft is:

- A. The shaft that supports the spider gears and transmits torque from the ring gear
- B. The shaft that connects the forward-rear axle to the rear-rear axle on tandems
- C. The shaft that transmits power from the transmission output to the pinion shaft
- D. The shaft that allows the wheel bearings to rotate during normal vehicle operation

36. A heavy-duty drive axle wheel bearing torque procedure typically includes:

- A. Maximum torque application without preload verification during the procedure
- B. Standard torque values without the rotation requirement during the installation
- C. Tighten while rotating the wheel, back off, then retighten to specification per TMC RP 618
- D. Apply battery voltage to the bearings for diagnostic testing during installation

37. The proper measurement procedure for ring gear backlash on a heavy-duty drive axle is to:

- A. Apply battery voltage to the ring gear for diagnostic testing during measurement
- B. Use a dial indicator at the ring gear tooth while holding the pinion stationary
- C. Listen for backlash-related noise with a stethoscope during operation
- D. Estimate backlash visually using shop lighting during the inspection process

38. The LEAST likely cause of a heavy-duty drive axle that develops a leak at the pinion seal area is:

- A. Worn pinion seal that has reached the end of its service life
- B. Excessive pinion bearing wear allowing radial movement of the shaft
- C. Damaged sealing surface on the pinion yoke from improper handling
- D. A failed coolant temperature sensor reading falsely cold to the engine ECM

39. The progression of damage from improper ring and pinion mesh adjustment typically begins with:

- A. Sudden complete gear failure within hours of operation under load
- B. Loss of all wheel bearing preload requiring immediate service intervention
- C. Gear noise, then accelerated tooth wear, then progressive mesh degradation
- D. External oil leakage at the pinion seal during the first highway operation

40. The proper procedure when reusing a heavy-duty drive axle pinion crush sleeve is:

- A. Reuse if visual inspection shows no obvious deformation during inspection
- B. Always replace with a new crush sleeve regardless of visual condition
- C. Apply anti-seize compound to the sleeve before reinstallation procedures
- D. Apply battery voltage to the sleeve for diagnostic testing during service

ANSWER KEY AND EXPLANATIONS

DOMAIN A — CLUTCH

1. C — Technician A is correct because heavy-duty pressure plate bolts must be torqued in stages, building from initial torque (typically around 25 ft-lbs) to final specification through multiple passes in a star pattern. Single-pass maximum torque produces uneven clamping and component distortion that compromise clutch function and longevity.
2. A — The flywheel runout specification on most heavy-duty diesel applications is 0.005 inches or less measured at the friction surface. Runout beyond this value produces clutch chatter, accelerated wear, and reduced engagement quality. Manufacturers specify exact tolerances in service information for each application.
3. B — Flywheel runout is measured by mounting a dial indicator on a fixed reference and rotating the flywheel slowly while observing indicator readings. The difference between maximum and minimum readings indicates total runout. The procedure requires careful indicator setup to ensure accurate measurement of true flywheel surface runout.
4. D — Transmission fluid level is unrelated to clutch chatter, which originates from clutch components rather than transmission lubricant. Oil contamination, glazed facings combined with flywheel variation, and damaged pressure plate springs all directly produce chatter through their effects on engagement quality and friction coefficient.
5. A — Contaminated clutch fluid requires complete system flush plus replacement of the master and slave cylinders. Contamination damages internal cylinder seals and creates corrosion that cannot be reversed by adding fresh fluid. The contaminated cylinders cannot reliably maintain proper hydraulic operation after exposure to debris.
6. D — Heavy-duty clutch fluid specifications vary by manufacturer and must be verified before service. Some applications use standard DOT 3 or DOT 4 brake fluid, while others require specialized hydraulic fluids. Using incorrect fluid causes seal damage, contamination, and system failure. Service information must be consulted for each application.
7. B — Maximum allowable clutch facing wear is typically expressed as a specified minimum thickness measured from the disc surface to rivet heads. When facings wear close to the rivet heads, the rivets contact the flywheel and pressure plate surfaces, damaging both and producing aggressive engagement. Specific minimum dimensions vary by application.
8. D — Determining whether chatter is from oil contamination versus glazing requires inspection of the disc and flywheel surfaces after clutch removal. Visual inspection of the friction surfaces

clearly shows oil contamination (oily appearance, possible discoloration) versus glazing (smooth, polished appearance). External observation cannot distinguish between these conditions.

9. A — The clutch release fork pivot point requires periodic lubrication during normal preventive maintenance service. The pivot operates with metal-to-metal contact under significant load during every clutch operation, requiring lubrication to prevent wear, binding, and noise. Manufacturers specify the lubricant type and intervals in service information.
10. B — Clutch disc cushioning is provided by a wave-shaped marcel spring between the two friction facings that compresses progressively during engagement. The marcel reduces shock loading on the drivetrain by providing gradual engagement rather than instantaneous lock-up. Worn or collapsed marcel produces harsh engagement and accelerated drivetrain wear.
11. A — Oil-contaminated clutch friction surfaces require identification and repair of the oil source (typically the rear engine seal or transmission input shaft seal), followed by replacement of the contaminated clutch components. Cleaning contaminated facings with solvent does not restore the original friction coefficient because oil penetrates the porous friction material.

DOMAIN B — TRANSMISSION

12. B — The countershaft thrust bearing controls axial movement of the countershaft during operation. Without proper thrust control, the countershaft can shift axially under load, producing misaligned gear meshes and accelerated wear. The thrust bearing handles axial forces while radial bearings handle the rotational support.
13. D — Transmission lubricant breaks down primarily from contamination by water (which produces corrosion and emulsification) and metal particles (which produce abrasive wear). Heat is a secondary factor that accelerates contamination effects. Pure thermal degradation occurs but is less significant than contamination-related breakdown in normal service conditions.
14. A — AMT clutch position sensor diagnosis begins with scan tool verification of the sensor signal, then inspection of wiring and mechanical actuator condition. The sensor may be functional with damaged wiring or a mechanically faulty actuator. Verification first determines whether the sensor or supporting components are the actual problem before parts replacement.
15. C — Output shaft thrust play of 0.030 inches indicates excessive clearance requiring service to identify the cause. Most heavy-duty transmissions specify thrust play in the 0.005 to 0.015 inch range. Excessive play typically indicates worn thrust washers, damaged thrust bearings, or component wear that requires investigation and correction.
16. B — Countershaft retaining nuts use specified torque values with an anti-rotation tool to hold the shaft during the torque application. Without the anti-rotation tool, the shaft rotates with the wrench, preventing accurate torque measurement. Improper torque allows the nut to loosen during operation, producing serious internal damage.

17. D — The Eaton Fuller 13-speed transmission uses a 5-speed main case with high/low range and splitter in the high range positions. The configuration provides 5 low-range gears (no splitter) and 8 high-range gears (5 standard plus 3 splitter steps), totaling 13 forward ratios.
18. A — Heavy-duty trucks typically share pneumatic supply across multiple systems including transmission shifts, fifth wheel operations, and air brakes. Pressure protection valves prevent loss of brake supply if other systems develop leaks. Complete independence is not required and would add unnecessary complexity to the truck design.
19. C — Damaged gear teeth on a specific gear produce noise only when that gear is engaged and carrying load. If only fifth gear produces grinding under load, the damage is on the fifth gear set specifically. Other gears function normally because their gear teeth remain undamaged. Bearing problems typically affect multiple gears.
20. D — Transmission case inspection during rebuild requires verification of bore conditions (for proper bearing seating), mating surfaces (for sealing integrity), and bolt thread integrity (for proper torque retention). External appearance and engine compatibility are not relevant to determining whether the case can be reused after disassembly.
21. D — The shift bar housing contains the shift rails, forks, detent springs, and interlock components that translate driver shift inputs into gear engagement. The housing is the upper portion of the transmission case that bolts to the main case, allowing access to shift components for service without disturbing the gear set.
22. A — Insufficient transmission lubricant produces a predictable progression: bearing wear first (bearings receive less splash lubrication than gears), then gear tooth damage as failed bearings contaminate the gear meshes, then catastrophic failure as accumulated damage compounds. Recognition of early stages prevents the catastrophic failure phase.
23. C — AMT clutch actuator stroke verification uses scan tool monitoring of actuator position during commanded clutch operation. The scan tool displays both commanded and actual position values, allowing the technician to verify whether the actuator is responding correctly to control commands. Voltage application and replacement do not verify functional operation.
24. B — ECT sensor errors affect engine fuel mixture but do not cause grinding during reverse engagement from a stop. The other choices all describe direct causes of reverse engagement grinding through clutch brake or clutch release problems. ECT is unrelated to the clutch system that controls input shaft rotation during stopped shifts.

DOMAIN C — DRIVESHAFT AND U-JOINTS

25. D — The minimum acceptable U-joint condition for return to service is no detectable play with smooth rotation through the full operating range. Any detectable play indicates wear that will progress to failure; rough rotation indicates internal damage. Both conditions require U-joint replacement before return to service to prevent failure during operation.

26. A — U-bolt-secured bearing caps require torque application to specification using a calibrated torque wrench at the U-bolt nuts. Proper torque ensures the caps are secured firmly without crushing the bearings or yoke ears. Maximum torque without measurement can damage components; insufficient torque allows the caps to work loose during operation.
27. C — A U-joint with surface rust but no detectable play remains functional and can continue in service with monitoring during routine inspections. Surface rust does not indicate internal damage; only detectable play or rough rotation indicate the need for replacement. Anti-seize compound on the bearing caps would interfere with proper retention.
28. B — Driveshaft phasing is verified by aligning reference marks on the driveshaft yokes during installation. The yokes are factory-marked or service-marked to ensure both U-joints operate in the same plane. Balancing equipment is used for balance verification, not phasing. Phasing is a geometric alignment, not a balance condition.
29. D — Constant velocity (CV) joints in heavy-duty truck applications are specialized components used in select applications where U-joint angles cannot be matched between the two ends of the driveshaft. CV joints maintain constant output velocity regardless of operating angle, eliminating the velocity fluctuation that requires equal U-joint angles on standard driveshafts.
30. C — Proper driveshaft removal includes marking the orientation (front and rear yoke positions) for reinstallation in the same configuration, supporting the assembly properly to prevent damage during removal, and removing fasteners systematically. Marking ensures the driveshaft returns to the same balanced position; support prevents component damage.
31. A — Slip joint inspection includes verification of spline condition (no galling or wear), lubrication state (proper grease distribution), and freedom of axial movement (no binding through the operating range). All three conditions must be acceptable for the slip joint to function properly during normal suspension travel.

DOMAIN D — DRIVE AXLE

32. C — Pinion bearing preload is established through a combination of crush sleeve compression or shim selection per service specification. Crush sleeve designs use controlled deformation of the sleeve as the pinion nut is torqued; shim designs use precision shims to set bearing position. Both methods produce specific preload that maintains proper bearing seating.
33. B — Heavy-duty drive axle ring and pinion gear sets typically use hypoid tooth designs that allow the pinion centerline to be offset below the ring gear centerline. This design lowers the driveshaft height for clearance with the truck frame and provides smooth, quiet operation under heavy torque. Straight-cut gears would produce excessive noise.
34. D — Differential cover gasket weeping requires complete service: drain the gear oil, remove the cover, replace the gasket, clean both surfaces, and refill with proper oil. Adding sealer without

disassembly does not address the failed gasket; continued operation allows progressive leakage and possible contamination of the differential.

35. A — The differential cross shaft supports the spider gears and transmits torque from the ring gear (through the differential carrier) to the spider gears, which then drive the side gears and axle shafts. The cross shaft passes through the carrier and holds the spider gears in their operating positions.
36. C — Heavy-duty wheel bearing torque procedure per TMC RP 618 includes tightening while rotating the wheel (to seat the bearings), backing off the adjusting nut, then retightening to specification. The rotation during initial torque ensures even bearing seating; the back-off prevents over-tightening; the final torque establishes proper preload or endplay.
37. B — Ring gear backlash is measured using a dial indicator positioned at a ring gear tooth while holding the pinion stationary. The ring gear is rotated by hand through the backlash range, with the indicator showing total movement. The reading is compared to specification to verify proper mesh; adjustments use carrier shims to correct out-of-spec backlash.
38. D — ECT sensor errors affect engine fuel mixture but do not cause pinion seal leakage. The other choices all describe direct causes of pinion seal failure: worn seal at end of service life, excessive bearing wear allowing radial movement that damages the seal, and damaged sealing surface that prevents proper seal contact.
39. C — Improper ring and pinion mesh produces a predictable progression: gear noise first (from improper tooth contact), then accelerated tooth wear (from concentrated stress on small contact areas), then progressive mesh degradation as wear changes the contact pattern further. Recognition of early gear noise allows correction before significant tooth damage.
40. B — Pinion crush sleeves must always be replaced with new sleeves regardless of visual condition. Once a crush sleeve has been compressed during initial installation, it cannot reliably provide the same preload during reinstallation. Reused sleeves produce either insufficient preload (if previously crushed) or excessive preload (if compressed beyond original setting), both leading to bearing failure.