PRACTICE EXAM 6: T3 SIMULATION (40 QUESTIONS)

DOMAIN A — CLUTCH (Questions 1–11)

1. A fleet maintenance technician finds three Class 8 tractors arriving with the same complaint of premature clutch facing wear within 60,000 miles of clutch replacement. All three trucks were serviced by the same outside shop. The most likely root cause across all three units is:

A. Defective replacement clutch components from a bad parts batch

B. Improper clutch installation procedure causing partial slip during operation

C. Engine performance issues causing overload on the new clutches simultaneously

D. Fleet operator routes that exceed clutch design specifications during operation

2. Technician A says heavy-duty Class 8 tractors typically use 14-inch diameter pull-type clutches with two driven discs. Technician B says heavy-duty Class 8 tractors typically use 11-inch diameter push-type clutches with single driven discs. 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

3. A scan tool data review on a heavy-duty AMT shows clutch position sensor reading 100% engaged when the clutch is commanded to fully release. The most likely cause is:

A. Mechanical linkage adjustment between the actuator and clutch fork

B. A failed coolant temperature sensor reading falsely cold to the engine ECM

C. Software calibration error requiring TCM reflash for proper operation

D. Worn clutch facings causing partial engagement during normal operation

4. The proper torque specification for heavy-duty clutch pressure plate to flywheel bolts is typically:

A. 15 to 25 ft-lbs applied in a single pass during installation

B. 200 to 250 ft-lbs applied in a single pass during installation

C. 35 to 50 ft-lbs in stages with a star pattern progression

D. 100 to 150 ft-lbs in stages without star pattern requirement

5. A heavy-duty truck arrives with the complaint that the clutch pedal pulses during partial engagement. The most likely cause is:

A. Worn clutch facings causing uneven engagement during the pedal travel

B. Excessive flywheel runout transmitting through the clutch components

C. Air introduced into the hydraulic system during recent service operations

D. Failed pilot bearing producing chatter during clutch engagement procedures

6. The proper procedure for resurfacing a heavy-duty flywheel includes:

A. Verification of remaining thickness against minimum specification limits

B. Maximum material removal regardless of remaining flywheel thickness

C. Visual inspection only without measurement during the resurfacing service

D. Application of battery voltage during the resurfacing procedure

7. Heavy-duty clutch master cylinder fluid level should be checked:

A. Only when the clutch shows symptoms of operational problems

B. Once annually as part of preventive maintenance scheduling

C. Only during major service procedures requiring system disassembly

D. Per manufacturer service interval, typically every PM inspection cycle

8. The LEAST likely cause of clutch fluid contamination is:

A. Water entry through a damaged or missing reservoir cap during operation

B. Internal seal degradation releasing material into the hydraulic system

C. Operating with the air conditioning system running continuously during service

D. Use of incorrect fluid type during previous service procedures

9. The proper way to identify whether a clutch chatter complaint originates from the clutch versus the engine is to:

A. Test the chatter pattern with the clutch fully engaged versus disengaged

B. Apply battery voltage to clutch components for diagnostic verification

C. Replace the clutch as preventive maintenance to confirm the source

D. Listen with a stethoscope on engine components during chatter occurrence

10. The Eaton self-adjusting heavy-duty clutch design uses:

A. Standard manual internal adjustment requiring periodic service intervals

B. Hydraulic pressure compensation that adjusts during operation continuously

C. A wear-compensating mechanism that eliminates manual internal adjustment

D. Electronic control compensation through the engine ECM during operation

11. A driver reports that the clutch pedal feels normal in cold weather but stiff and slow to return after the engine reaches operating temperature. The most likely cause is:

A. Air introduced into the hydraulic system during recent service procedures

B. Worn clutch facings affecting engagement at operating temperature only

C. Failed pilot bearing producing resistance during clutch engagement

D. Master cylinder seal degradation that worsens with thermal expansion

DOMAIN B — TRANSMISSION (Questions 12–24)

12. A scan tool review on a Volvo I-Shift AMT shows fault code referencing the X-Y shifter position sensor. The proper diagnostic priority is:

A. Verify sensor signal with scan tool, then inspect wiring and mechanical condition

B. Replace the X-Y shifter assembly as the primary repair component

C. Apply battery voltage to the sensor terminals for diagnostic verification

D. Replace the entire transmission as preventive maintenance procedure

13. Technician A says heavy-duty manual transmission lubricant capacity typically ranges from 12 to 16 quarts depending on the model. Technician B says heavy-duty manual transmission lubricant capacity typically ranges from 4 to 6 quarts on most fleet applications. 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

14. The proper service action when a heavy-duty manual transmission shows minor metallic glitter on the magnetic drain plug during routine fluid service is:

A. Replace the transmission immediately as preventive maintenance procedure

B. Continue operation since minor metallic glitter has minimal effect during operation

C. Apply battery voltage to the transmission for diagnostic testing during service

D. Document the finding, refill with proper lubricant, and monitor at next service

15. The Detroit DT12 AMT uses which clutch actuation system?

A. Hydraulic actuation with electric pump for power assist during operation

B. Vacuum-assisted mechanical actuation through standard linkage

C. Pneumatic actuation using the truck's compressed air supply system

D. Manual actuation requiring driver pedal input during all operations

16. The proper procedure when reusing a heavy-duty transmission case during rebuild includes inspection for:

A. Cracks at bolt boss areas, bore wear at bearing locations, and mating surface flatness

B. External paint condition and decal placement during the inspection process

C. Engine compatibility verification with the transmission application

D. Vehicle type compatibility with the transmission case during the rebuild

17. The most likely consequence of operating a heavy-duty AMT with an incorrect calibration after TCM replacement is:

A. Immediate transmission failure requiring complete replacement service

B. Erratic shift behavior, harsh engagement, and possible component damage

C. Loss of engine power requiring engine ECM replacement during service

D. External lubricant leakage requiring case repair during the next service

18. The most accurate description of an Eaton Fuller 18-speed transmission shift sequence in low range is:

A. Five sequential gears without splitter steps in the low range positions

B. Five sequential gears with full splitter activation in low range positions

C. Three sequential gears with splitter activation between standard ratios only

D. Five sequential gears with splitter activation between each standard gear

19. The proper torque specification for heavy-duty transmission case bolts is determined by:

A. Standard automotive torque specifications for similar bolt diameter applications

B. Maximum torque applied that the bolt can sustain without thread failure

C. Manufacturer service information specific to the transmission model and bolt grade

D. Visual estimation based on bolt size during the installation procedure

20. The shift fork pad on a heavy-duty manual transmission is typically constructed of:

A. Hardened steel for maximum wear resistance during normal operation

B. Bronze or composite material designed to wear before damaging the sliding clutch

C. Aluminum alloy for lightweight construction during normal operation

D. Stainless steel for corrosion resistance during long-term storage

21. A driver complaint of an AMT that "hunts" between two gears during steady highway operation most likely indicates:

A. Engine and transmission ECM communication problem affecting shift logic

B. Worn synchronizer rings allowing partial engagement between gears

C. Insufficient air supply pressure for shift completion during operation

D. A failed coolant temperature sensor reading falsely cold to the engine ECM

22. The proper diagnostic approach for a heavy-duty manual transmission grinding noise that occurs only when shifting between specific gears is to:

A. Apply battery voltage to the affected gears for diagnostic testing during operation

B. Replace the entire transmission as preventive maintenance procedure

C. Verify clutch release is complete and inspect specific gear engagement components

D. Listen for noise with a stethoscope at idle without addressing root cause

23. The countershaft thrust bearing endplay specification on most heavy-duty manual transmissions is typically:

A. 0.030 to 0.060 inches measured at the countershaft during inspection

B. 0.005 to 0.015 inches measured at the countershaft during inspection

C. 0.100 to 0.150 inches measured at the countershaft during inspection

D. No specified limit; replacement based on visual inspection only

24. The LEAST likely cause of a heavy-duty manual transmission that won't shift into any forward gear from neutral is:

A. Failed clutch hydraulic system preventing complete clutch release

B. Damaged shift rail interlock preventing rail movement during shifts

C. Severely worn shift forks preventing engagement of any gear

D. A failed coolant temperature sensor reading falsely cold to the engine ECM

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

25. A heavy-duty truck with a two-piece driveshaft develops vibration only at highway speeds above 55 mph. The most likely cause is:

A. Driveshaft imbalance, missing balance weight, or out-of-phase yokes

B. Center support bearing failure with broken rubber isolation mount

C. Slip joint binding during normal suspension travel cycling

D. Worn U-joints producing free play during normal operation conditions

26. The proper torque specification for U-joint strap bolts on most heavy-duty applications is typically:

A. 5 to 10 ft-lbs applied during installation procedures

B. 100 to 150 ft-lbs applied during installation procedures

C. 25 to 40 ft-lbs applied during installation procedures

D. 200 to 250 ft-lbs applied during installation procedures

27. The most accurate description of a heavy-duty truck driveshaft balance check is:

A. Required after every U-joint replacement during routine service procedures

B. Performed when vibration symptoms appear, using a balance machine or wheel-weight method

C. Annual preventive maintenance item regardless of vibration symptoms during operation

D. Required only after major collision damage to the driveshaft components

28. A heavy-duty driveshaft slip joint that shows seizure during inspection most likely failed due to:

A. Excessive operating angles forcing the splines into binding contact

B. Manufacturing defect in the original spline machining during production

C. Normal wear from extended service that requires replacement at scheduled intervals

D. Inadequate lubrication allowing corrosion and metal-to-metal galling on splines

29. Technician A says the proper torque application sequence for U-joint strap bolts uses a star pattern with multiple passes. Technician B says U-joint strap bolts can be torqued to specification in a single pass without component damage. 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 accurate description of driveshaft maintenance for greaseable U-joints includes:

A. Lubrication only during major service procedures requiring driveshaft removal

B. Annual lubrication regardless of mileage accumulation during operation

C. Lubrication at manufacturer-specified intervals using approved grease type

D. No lubrication required since modern U-joints are sealed for service life

31. The LEAST likely consequence of operating a heavy-duty driveshaft with a missing balance weight is:

A. Vibration that increases progressively with road speed during operation

B. Accelerated U-joint wear from cyclic loading during normal operation

C. Center support bearing rubber mount fatigue from absorbed vibration

D. Loss of engine braking effectiveness during downhill driving operation

DOMAIN D — DRIVE AXLE (Questions 32–40)

32. The proper procedure when replacing a heavy-duty drive axle pinion seal includes:

A. Marking the pinion nut position, removing the seal, and replacing without disturbing pinion preload

B. Complete pinion removal and bearing replacement during seal service procedure

C. Apply battery voltage to the pinion area for diagnostic testing during service

D. Listen for pinion noise with a stethoscope before performing the seal replacement

33. A heavy-duty tandem drive axle shows a leak at the inter-axle differential housing. The most likely source is:

A. Excessive lubricant level pushing through the housing vent during operation

B. Normal operating condition not requiring service action during inspection

C. Worn IAD output shaft seal allowing lubricant past the rotating shaft surface

D. A failed coolant temperature sensor reading falsely cold to the engine ECM

34. Technician A says heavy-duty drive axle wheel bearings should be torqued to TMC RP 618 specifications. Technician B says wheel bearing torque values are determined by manufacturer-specific service information for each application. 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

35. The proper measurement procedure for heavy-duty drive axle wheel bearing endplay is to:

A. Apply battery voltage to the bearings for diagnostic testing during measurement

B. Estimate endplay visually using shop lighting during the inspection process

C. Listen for endplay-related noise with a stethoscope during operation

D. Use a dial indicator to measure axial movement after proper bearing adjustment

36. A heavy-duty drive axle with new ring and pinion gears shows a coast-side concentrated tooth contact pattern after marking compound check. The proper correction is to:

A. Decrease pinion depth using thinner shims behind the pinion bearing race

B. Increase pinion depth using thicker shims behind the pinion bearing race

C. Adjust differential carrier preload to higher specification during the service

D. Replace the ring and pinion gear set with new components during the service

37. The most accurate description of heavy-duty drive axle differential carrier shim adjustment is:

A. Used to set wheel bearing preload during installation procedures

B. Required only during pinion replacement during service operations

C. Used to set ring gear backlash and carrier bearing preload simultaneously

D. Applied to the spider gears during normal differential carrier service

38. The LEAST likely cause of drive axle gear oil that shows excessive moisture content during analysis is:

A. Failed differential housing vent allowing moisture entry during operation

B. A failed coolant temperature sensor reading falsely cold to the engine ECM

C. Damaged pinion or wheel seal allowing water entry during operation

D. Submersion during operation through deep water during the application

39. The proper service interval for heavy-duty drive axle gear oil change on most fleet applications is:

A. Every 10,000 miles regardless of operating conditions during operation

B. Lifetime fill — no service required during normal operation conditions

C. Every 25,000 miles for all applications regardless of operating environment

D. Per manufacturer specification, typically 100,000 to 250,000 miles based on application

40. A heavy-duty drive axle that produces noise during all operating conditions but is loudest during cornering most likely indicates:

A. Ring and pinion gear wear affecting all operating conditions equally

B. Differential side gear, spider gear, or wheel bearing wear on the loaded side

C. Insufficient gear oil level affecting overall axle operation conditions

D. Pinion preload set too tightly at the last service event during operation

ANSWER KEY AND EXPLANATIONS

DOMAIN A — CLUTCH

1. B — When multiple trucks from the same shop show the same premature wear pattern, improper installation procedure is the most likely common factor. Misalignment, incorrect adjustment, or partial engagement during installation produces partial slip throughout service, generating heat that wears facings rapidly. Defective parts batches and route issues are less likely to affect three trucks identically.

2. D — Heavy-duty Class 8 tractors typically use 14-inch diameter pull-type clutches with two driven discs (twin-disc design). The twin-disc configuration provides higher torque capacity in the same diameter package, essential for handling the high torque of modern Class 8 diesel engines. Smaller diameter and push-type designs are typical of medium-duty applications.

3. A — Mechanical linkage adjustment between the actuator and clutch fork is the most likely cause of position sensor disagreement with commanded position. The actuator may be moving correctly, but if the linkage is out of adjustment, the clutch position does not match the commanded position. This is a mechanical issue rather than electronic.

4. C — Heavy-duty clutch pressure plate bolts torque to approximately 35 to 50 ft-lbs in stages using a star pattern. The staged approach ensures even clamping force across the assembly, with multiple passes building from initial torque to final specification. Single-pass maximum torque produces uneven clamping and component distortion.

5. B — Pedal pulsing during partial engagement most likely indicates excessive flywheel runout transmitting through the clutch components. The runout produces uneven engagement pressure during pedal travel, felt as pulsation through the pedal. Worn facings, air in hydraulics, and pilot bearing failure produce different symptoms with different diagnostic signatures.

6. A — Flywheel resurfacing requires verification of remaining thickness against minimum specification limits. Resurfacing removes material; if too much is removed, the flywheel becomes too thin to safely transmit torque or maintain the proper clutch geometry. The specification establishes the minimum thickness allowed before flywheel replacement is required.

7. D — Clutch master cylinder fluid level should be checked per manufacturer service intervals, typically every preventive maintenance inspection cycle. Regular checking catches small leaks before they cause clutch failure and ensures the system maintains proper hydraulic operation. Symptom-only checking allows problems to develop into failures.

8. C — Air conditioning system operation does not affect clutch fluid contamination. The other choices all describe direct sources of contamination: water entry through damaged caps, internal

seal degradation releasing particles, and incorrect fluid types causing chemical incompatibility. The HVAC system has no fluid path to the clutch hydraulic system.

9. A — Testing the chatter pattern with the clutch fully engaged versus disengaged isolates the source. If chatter occurs when the clutch is fully disengaged (engine running, clutch pedal to the floor), the source is on the engine side (flywheel, harmonic balancer, etc.). If chatter occurs only during engagement, the source is the clutch itself.

10. C — The Eaton self-adjusting heavy-duty clutch uses a wear-compensating mechanism that eliminates manual internal adjustment. As facings wear, the mechanism automatically compensates by repositioning the pressure plate fingers to maintain proper free travel and clamping force. This extends service intervals by eliminating periodic manual adjustment.

11. A — Air introduced into the hydraulic system produces pedal problems that worsen with operating temperature because air expands more than fluid as temperature rises. The expanded air increases system pressure and changes pedal feel from cold (compressed air) to hot (expanded air) operation. Cold-only normal operation followed by hot stiffness is a classic symptom of air contamination.

DOMAIN B — TRANSMISSION

12. A — X-Y shifter position sensor diagnosis begins with scan tool verification of sensor signal, then inspection of wiring and mechanical condition. The sensor may be functional with damaged wiring, or the mechanical actuator may be the actual problem. Verification first determines the actual fault location before parts replacement.

13. B — Heavy-duty manual transmissions typically hold 12 to 16 quarts of lubricant depending on the model (Eaton Fuller 10-speed, 13-speed, and 18-speed all fall in this range). The 4-to-6 quart range is more typical of medium-duty or passenger car manual transmissions. Heavy-duty designs require larger volumes to manage the heat and contamination loads of high-torque operation.

14. D — Minor metallic glitter on the drain plug during routine service typically indicates normal break-in or accumulated wear that does not require immediate action. Documentation, refill with proper lubricant, and monitoring at the next service catches progression. Excessive particles or visible chunks would indicate the need for further inspection.

15. C — The Detroit DT12 AMT uses pneumatic actuation with the truck's compressed air supply for clutch and shift operations. The pneumatic system is shared with other truck systems through pressure protection valves. This is consistent across most heavy-duty AMTs in North American fleet service.

16. A — Transmission case rebuild inspection requires verification of cracks at bolt boss areas (where stress concentrates), bore wear at bearing locations (which affects bearing seating), and mating surface flatness (which affects sealing). All three conditions affect whether the case can be safely returned to service after rebuild.

17. B — Incorrect AMT calibration after TCM replacement produces erratic shift behavior, harsh engagement, and possible component damage. The calibration controls clutch engagement timing, shift sequencing, and engine-transmission coordination. Wrong calibration disrupts these functions, potentially damaging clutch, gearset, or driveline components if operation continues.

18. D — The Eaton Fuller 18-speed uses five sequential gears with splitter activation between each standard gear in the low range. The configuration produces 9 forward ratios in low range (5 standard plus 4 splitter steps), with another 9 in high range, totaling 18 forward gears.

19. C — Transmission case bolt torque values come from manufacturer service information specific to the transmission model and bolt grade. Standard automotive specifications and visual estimation are inadequate for heavy-duty equipment because incorrect torque can cause case distortion, leakage, or bolt failure.

20. B — Shift fork pads are typically constructed of bronze or composite material designed to wear before damaging the sliding clutch. The softer pad material wears as a sacrificial component, protecting the more expensive sliding clutch and allowing simple pad replacement during service. Hardened steel pads would damage the sliding clutch instead.

21. A — AMT "hunting" between two gears during steady operation indicates engine and transmission ECM communication problems affecting shift logic. The TCM cannot determine whether to shift up or stay in the current gear due to inconsistent or missing data from the engine ECM. Synchronizer wear and ECT sensor errors produce different symptoms.

22. C — Grinding only between specific gears requires verification of complete clutch release first, then inspection of the specific gear engagement components. The clutch may not be fully releasing only during certain shift transitions, or specific gear teeth may be worn. Targeted diagnosis identifies the actual cause without unnecessary replacement.

23. B — Countershaft thrust bearing endplay on most heavy-duty manual transmissions specifies 0.005 to 0.015 inches at the countershaft. Excessive endplay allows axial movement that misaligns gear meshes; insufficient endplay produces bearing preload that overheats bearings. The narrow specified range balances both concerns.

24. D — ECT sensor errors affect engine fuel mixture but do not directly prevent transmission shifts from neutral. The other choices all describe direct causes of inability to shift: failed clutch hydraulics prevent complete release, damaged shift rail interlock prevents rail movement, and severely worn shift forks prevent engagement.

DOMAIN C — DRIVESHAFT AND U-JOINTS

25. A — Highway-speed-only vibration on a two-piece driveshaft most likely indicates driveshaft imbalance, missing balance weight, or out-of-phase yokes. These conditions produce vibration that scales with rotational speed, becoming noticeable at highway speeds when driveshaft RPM is highest. Lower speeds may not generate enough centrifugal force to feel the imbalance.

26. C — U-joint strap bolts torque to approximately 25 to 40 ft-lbs on most heavy-duty applications. This range secures the bearing caps without crushing the U-joint or yoke ears. Higher torque can damage components; lower torque allows the bolts to work loose during operation. Manufacturer service information specifies exact values.

27. B — Driveshaft balance checks are performed when vibration symptoms appear, using either a balance machine (precision shop service) or wheel-weight method (field service). Balance is not required after every U-joint replacement on most applications, as factory balance typically remains within tolerance. Annual balance checks are not standard practice.

28. D — Slip joint seizure most commonly results from inadequate lubrication that allowed corrosion and metal-to-metal galling on the splines. Without proper lubrication, the splines contact directly under load, producing galling that progresses to seizure. Manufacturing defects and excessive operating angles produce different failure patterns.

29. A — U-joint strap bolts use a star pattern with multiple passes to ensure even bearing cap seating without yoke distortion. Single-pass torque can produce uneven loading that distorts the yoke or improperly seats the bearing caps. The star pattern progressively builds clamping force evenly across all four bolts.

30. C — Greaseable U-joint maintenance includes lubrication at manufacturer-specified intervals using approved grease type. Intervals typically range from 25,000 to 50,000 miles depending on application. The grease type matters because U-joint operating conditions require specific viscosity and additive packages that standard chassis grease may not provide.

31. D — A missing balance weight does not affect engine braking, which operates through the engine and transmission rather than the driveshaft. Vibration with road speed, accelerated U-joint wear, and center support bearing fatigue all directly result from imbalance. Engine braking effectiveness depends on engine and transmission components, not driveshaft balance.

DOMAIN D — DRIVE AXLE

32. A — Pinion seal replacement procedure includes marking the pinion nut position, removing the seal, and replacing without disturbing pinion preload. Marking the nut position allows the technician to return the pinion nut to its original position, maintaining the original crush sleeve compression and bearing preload. Disturbing the preload requires complete pinion bearing reset.

33. C — IAD housing leaks most commonly originate from a worn output shaft seal where the shaft exits the housing. The rotating shaft surface eventually wears past the seal's contact area, producing the leak. Excessive lubricant level produces vent leakage but not housing seal leakage; ECT sensor errors are unrelated to drive axle seals.

34. B — Both Technician A and Technician B are correct because TMC RP 618 establishes industry-standard wheel bearing torque procedures that most manufacturers follow, while specific values

may vary by application per manufacturer service information. Both sources contribute to the proper torque procedure for any specific drive axle.

35. D — Drive axle wheel bearing endplay is measured using a dial indicator after proper bearing adjustment. The indicator measures axial movement when the wheel is pulled outward and pushed inward, with the difference being total endplay. The reading is compared to specification (typically 0.001 to 0.005 inch per TMC RP 618) to verify proper adjustment.

36. A — Coast-side concentrated tooth contact pattern indicates the pinion is positioned too deep, requiring decreased pinion depth using thinner shims behind the pinion bearing race. The thinner shims move the pinion away from the ring gear, shifting the contact pattern toward the drive side. The marking compound check guides the correction direction.

37. C — Differential carrier shims are used to set ring gear backlash and carrier bearing preload simultaneously. Adding shims on one side moves the ring gear toward that side (changing backlash) while affecting bearing preload through total shim thickness. The carrier setup balances both adjustments through proper shim selection.

38. B — ECT sensor errors do not affect drive axle gear oil moisture content. The other choices all describe direct sources of moisture contamination: failed vents allow atmospheric moisture entry, damaged seals allow water entry, and submersion during operation introduces water through any compromised sealing point.

39. D — Drive axle gear oil change intervals follow manufacturer specifications, typically 100,000 to 250,000 miles based on application. Highway applications use longer intervals; severe-duty and vocational applications use shorter intervals. The lifetime-fill claim is inaccurate; gear oil deteriorates over time even on highway applications and requires periodic replacement.

40. B — Drive axle noise loudest during cornering indicates differential side gear, spider gear, or wheel bearing wear on the loaded side. Cornering shifts load to the inside or outside wheel during the turn, exposing wear on the loaded components. Ring and pinion wear typically produces consistent noise across operating conditions, not cornering-specific patterns.