

PRACTICE EXAM 2: T3 SIMULATION

(40 QUESTIONS)

DOMAIN A — CLUTCH (Questions 1–11)

1. A driver complains the clutch pedal feels stiff and stays close to the floor after each shift, returning slowly to the top. The most likely cause is:

- A. Excessive pedal free play preventing complete clutch release
- B. Worn clutch facings below minimum thickness specification
- C. A weakened or broken clutch pedal return spring
- D. Air introduced into the hydraulic clutch line during service

2. Technician A says a worn pilot bearing typically produces noise with the clutch pedal pressed and the engine running. Technician B says a worn release bearing typically produces noise with the clutch pedal pressed and the engine running. 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

3. All of the following can cause a heavy-duty clutch to fail to release completely EXCEPT:

- A. Air introduced into the hydraulic release system during service
- B. Excessive pedal free play preventing full release stroke

- C. Damaged clutch disc preventing proper separation from flywheel
- D. Worn clutch disc facings below minimum thickness specification

4. A pull-type clutch shows premature release bearing failure on three consecutive replacements. Linkage adjustment is verified within specification. The most likely cause is:

- A. Pressure plate finger height variation across the springs
- B. The driver riding the clutch pedal during normal operation
- C. Hydraulic slave cylinder pressure leakage at engine idle
- D. Clutch brake adjustment slightly out of factory tolerance

5. The LEAST likely cause of clutch slippage under load on grades is:

- A. Worn clutch disc facings below minimum thickness specification
- B. Air introduced into the hydraulic clutch line during service
- C. Weak or broken pressure plate springs reducing clamping force
- D. Oil contamination on the clutch friction surfaces from a leak

6. Technician A says clutch facings worn below minimum thickness must be replaced and cannot be restored by adjustment. Technician B says clutch internal adjustment can compensate for worn facings indefinitely. 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

7. A heavy-duty clutch with two driven discs is found to have excessive runout on one disc but not the other. The most likely cause is:

- A. Pressure plate distortion from severe overheating in service
- B. Flywheel surface warpage exceeding service limits during use
- C. A bent clutch disc from improper installation handling
- D. Worn intermediate plate causing assembly misalignment issues

8. The proper inspection procedure to verify clutch disc thickness is to:

- A. Apply battery voltage to the disc for diagnostic testing purposes
- B. Listen for clutch noise with a stethoscope during operation
- C. Replace the clutch as preventive maintenance during major service
- D. Measure remaining facing thickness against the manufacturer specification

9. A driver reports clutch chatter that occurs only when the engine is cold and disappears as it warms up. The most likely cause is:

- A. Glazed clutch facings combined with minor flywheel surface variation
- B. Worn release bearing producing noise during pedal application
- C. Excessive transmission fluid level above maximum fill mark
- D. A failed pilot bearing producing noise during clutch engagement

10. The proper procedure for installing a heavy-duty clutch disc is to:

- A. Press the disc onto the flywheel pilot bearing for retention
- B. Apply battery voltage to the assembly for diagnostic testing
- C. Use a clutch alignment tool to center the disc on the pilot bearing

D. Tighten pressure plate bolts to maximum torque without measurement

11. A driver reports the clutch grabs aggressively even with smooth pedal release after the truck sits overnight in cold weather. The clutch operates normally once the engine reaches operating temperature. The most likely cause is:

- A. A failed clutch brake at the input shaft splines area
- B. Cold-condensed moisture on glazed friction facings causing initial grab
- C. Excessive transmission fluid level above the maximum fill mark
- D. A failed crankshaft position sensor producing intermittent signals

DOMAIN B — TRANSMISSION (Questions 12–24)

12. A driver reports a 13-speed transmission jumps out of fifth gear under hard acceleration. The most likely cause is:

- A. Insufficient lubricant level in the auxiliary section housing
- B. Air pressure regulator out of factory calibration setting
- C. Synchronizer ring on fifth gear worn beyond service limits
- D. Worn shift fork pad or weakened detent spring on that rail

13. Technician A says heavy-duty manual truck transmissions use synchronizers similar to passenger car designs. Technician B says heavy-duty manual truck transmissions are non-synchronized and require double-clutching. 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 slave valve in the auxiliary section of an air-shift transmission:

- A. Reduces system line pressure to safe levels for the actuator
- B. Prevents range shifts unless the main case is in neutral position
- C. Activates the splitter cylinder during partial-throttle shift events
- D. Protects the system from over-pressurization during cold engine starts

15. A 10-speed transmission shows excessive countershaft endplay during inspection. If not corrected, the most likely consequence is:

- A. Premature gear tooth wear and bearing failure during operation
- B. Loss of high-range engagement during normal highway operation
- C. Inability to engage reverse gear from the neutral position
- D. Slipping out of fifth and sixth gears under heavy load

16. The LEAST likely cause of transmission lubricant overheating during sustained operation is:

- A. Plugged transmission cooler restricting normal lubricant flow
- B. Lubricant level above the maximum fill mark indication
- C. Operating in the lowest gears for extended distances under load
- D. Overdrive gear engaged during steady-state highway cruising

17. Technician A says range shifts on heavy-duty manual transmissions are pneumatically actuated. Technician B says splitter shifts on 13-speed transmissions provide additional ratios between standard shift positions. Who is correct?

- A. Technician A only
- B. Both Technician A and Technician B

C. Neither Technician A nor Technician B

D. Technician B only

18. An automated manual transmission sets a fault code referencing the X-Y shifter. The X-Y shifter is responsible for:

A. Engaging the range and splitter cylinders during normal shift events

B. Controlling the clutch actuator pressure during launch operations

C. Moving the shift rails to engage the gear selected by the TCM

D. Synchronizing input shaft speed to output shaft speed during shifts

19. A driver complains that an AMT shifts harshly during downshifts under braking. The most likely contributing factor is:

A. Engine and transmission ECMs not properly communicating shift requests

B. Worn synchronizer rings allowing partial gear engagement during shifts

C. Insufficient lubricant level in the auxiliary section of the transmission

D. Clutch facing material worn below minimum thickness specification

20. All of the following can cause hard shifting in a heavy-duty manual transmission EXCEPT:

A. Worn shift forks affecting proper gear engagement during operation

B. Insufficient air supply pressure for range and splitter actuation

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

D. Clutch brake out of adjustment preventing input shaft from stopping

21. The proper diagnostic procedure when an AMT shows erratic shift behavior is to:

- A. Adjust the throttle linkage at the engine for proper shift control
- B. Replace the transmission as preventive maintenance during the visit
- C. Apply battery voltage to the shift actuators for diagnostic testing
- D. Connect a scan tool to retrieve TCM fault codes and review live data

22. A heavy-duty manual transmission grinds when shifting into reverse from neutral with the truck stopped. The most likely cause is:

- A. The clutch brake worn or out of adjustment for the application
- B. A failed crankshaft position sensor producing intermittent signals
- C. Excessive transmission fluid level above the maximum fill mark
- D. A failed catalytic converter creating excessive exhaust restriction

23. The most accurate description of twin-countershaft transmission design advantage is:

- A. Reduced internal lubrication requirements at high RPM operation
- B. Elimination of the need for an auxiliary section in the transmission
- C. Distribution of torque load across two countershafts for higher capacity
- D. Faster gear engagement through automatic synchronization during shifts

24. A LEAST likely cause of an AMT clutch actuator producing slow engagement is:

- A. Air supply pressure problems affecting actuator operation
- B. A failed coolant temperature sensor reading falsely cold to the ECM
- C. Actuator wear from extended service in the application

D. Contamination causing valve sticking in the actuator circuit

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

25. A driver reports vibration that increases with vehicle speed across the operating range. Tire and wheel balance is verified correct. The inspection finding most strongly supporting a driveshaft cause is:

- A. A slip joint with light surface wear visible on the splines
- B. A center support bearing showing minor surface corrosion
- C. A universal joint cap rotation when grasped firmly by hand
- D. A driveshaft balance weight missing from the tube surface

26. Technician A says U-joint operating angles at front and rear should be approximately equal to cancel velocity fluctuations. Technician B says U-joint operating angles should be as steep as possible to maximize suspension travel. 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

27. The LEAST likely consequence of a slip joint binding during suspension travel is:

- A. Driveline vibration during normal cycling of the suspension
- B. Accelerated U-joint wear from absorbed axial loading forces
- C. Loss of engine braking effectiveness during downhill operation
- D. Premature transmission output shaft seal failure from forces

28. Driveshaft phasing on a two-piece driveshaft refers to:

- A. The torque sequence used when tightening U-joint cap retainers
- B. The alignment of front and rear U-joint yokes in the same plane
- C. The timing of suspension travel relative to length change events
- D. The angular relationship of slip joint splines to the output shaft

29. The most accurate method to inspect a U-joint for wear is to:

- A. Apply battery voltage to the joint for diagnostic testing purposes
- B. Listen for U-joint noise with a stethoscope during driveshaft rotation
- C. Replace the U-joint as preventive maintenance during regular service
- D. Attempt to move the cross within the yoke ears for any free play

30. A driveshaft assembly that is unbalanced after U-joint replacement most commonly produces:

- A. Vibration that increases with road speed during normal vehicle operation
- B. No noticeable symptoms during normal operation of the vehicle
- C. Excessive transmission fluid temperature during operation conditions
- D. A failed coolant temperature sensor reading falsely cold to the ECM

31. The center support bearing on a multi-piece driveshaft serves which primary function?

- A. Reducing torsional vibration through internal rubber damping action
- B. Supporting the driveshaft and isolating vibration from the chassis
- C. Providing constant velocity output to the rear differential during operation
- D. Allowing length changes during normal suspension travel cycling

DOMAIN D — DRIVE AXLE (Questions 32–40)

32. A heavy-duty tandem drive axle produces a low-speed clunk during throttle transitions. The most likely cause is:

- A. Pinion preload set too tightly at the last service event
- B. Wheel bearing endplay at the minimum specification limit
- C. Crossmember mounting bolts loose at the frame attachment point
- D. Excessive backlash between the ring and pinion gear set

33. The inter-axle differential (IAD) on a tandem drive axle:

- A. Allows speed differences between the forward-rear and rear-rear axles
- B. Distributes torque between the left and right wheels of the rear-rear
- C. Provides reduction gearing between the forward-rear and rear-rear units
- D. Engages both axles automatically when wheel slip is detected at speed

34. Technician A says the IAD lock should be engaged at highway speeds for better traction. Technician B says the IAD lock should only be engaged at low speeds on slick or off-road surfaces. 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

35. All of the following are direct consequences of operating with the IAD lock engaged on dry pavement at highway speeds EXCEPT:

- A. Severe drivetrain stress from windup that cannot be relieved
- B. Tire scuffing as both axles rotate at exactly the same speed
- C. Progressive damage to driveline components from continuous load
- D. Reduced fuel economy from increased rolling resistance at speed

36. During pinion preload setting on a heavy-duty drive axle, the most accurate measurement method is:

- A. Counting the number of turns applied to the pinion nut during install
- B. Measuring rotational drag torque with a beam-type torque wrench
- C. Visual inspection of bearing seating after final installation steps
- D. Measuring pinion endplay with a dial indicator gauge after assembly

37. A drive axle wheel seal leak that allows gear oil contamination of the brake friction surfaces requires:

- A. Replacement of the wheel seal only and brake cleaning with a solvent
- B. Adjustment of axle endplay to compensate for the seal failure on that side
- C. Replacement of the wheel seal and full brake friction component replacement
- D. Pinion seal replacement to address the underlying lubrication issue overall

38. The LEAST likely cause of drive axle whining noise that varies with vehicle speed is:

- A. A failed coolant temperature sensor reading falsely cold to the engine ECM
- B. Improper ring and pinion gear mesh from incorrect setup at last service
- C. Worn ring and pinion gear teeth from extended service in the application

D. Damaged bearing rollers in the inter-axle differential of the assembly

39. Technician A says ring-and-pinion gear sets are factory-lapped together and must be replaced as a matched pair. Technician B says reusing one component with a new replacement causes accelerated wear and gear noise. Who is correct?

A. Neither Technician A nor Technician B

B. Both Technician A and Technician B

C. Technician A only

D. Technician B only

40. A drive axle wheel bearing endplay reading shows zero movement when the wheel is pulled outward with a dial indicator. This condition indicates:

A. Correct adjustment within manufacturer specification limits for the bearing

B. Excessive endplay that requires immediate adjustment during the service

C. Wheel seal failure preventing axial movement of the hub during the test

D. Bearing preload that may cause overheating and premature bearing failure

ANSWER KEY AND EXPLANATIONS

DOMAIN A — CLUTCH

1. C — A weakened or broken pedal return spring allows the pedal to drop and remain low after each shift, returning slowly because nothing pulls it back to the top. Master cylinder seal failure produces pedal sink under steady pressure rather than slow return. Air in the line creates a spongy pedal feel rather than delayed return.
2. A — Both bearings produce noise specifically when the clutch pedal is pressed because that condition unloads the pilot bearing and loads the release bearing. The pilot bearing carries the input shaft when disengaged; the release bearing contacts the pressure plate fingers under spring pressure. Both share the same noise condition with different acoustic signatures.
3. D — Worn facings cause slipping under load, not failure to release. Air in the hydraulic line, excessive free play, and a damaged disc all directly prevent the clutch from disengaging completely. Worn facings reduce friction surface but do not prevent the disc from separating from the flywheel when the clutch is released.
4. B — Riding the clutch keeps the release bearing in continuous contact with the pressure plate fingers, generating constant friction and heat that destroys bearings rapidly. With linkage verified in specification, driver behavior becomes the leading systemic cause of repeated bearing failure on the same vehicle. The pattern of repeated failures points strongly to operator habit.
5. B — Air in the hydraulic line affects clutch release, not engagement under load. Worn facings, weak springs, and oil contamination all directly reduce clamping force or friction coefficient, producing slip under load. Slip is a clamping or friction problem, while air in the line is a release problem.
6. A — Worn facings below minimum specification cannot be restored by internal adjustment because adjustment compensates for normal wear within service limits, not material loss below minimums. Continuing to adjust below minimum allows clutch failure with cascading damage. Technician B describes a misuse that destroys clutches.
7. C — A bent disc affects only the disc that was damaged, while pressure plate distortion or flywheel warpage would affect both discs equally. Improper handling during installation — dropping the disc, prying against it, or twisting it during installation — is the typical root cause of single-disc runout in twin-disc assemblies.
8. D — Measuring remaining facing thickness against the manufacturer specification is the only accurate method to verify disc serviceability. Voltage testing has no relevance to clutch friction

material. Stethoscopes detect noise but not thickness. Replacement without measurement wastes serviceable components and labor unnecessarily.

9. A — Glazed clutch facings combined with minor flywheel surface variation produces chatter that is most noticeable when cold because thermal expansion has not yet seated the contact surfaces. As components warm and expand, contact normalizes and the chatter resolves. Persistent chatter at all temperatures indicates more severe problems.
10. C — A clutch alignment tool centers the disc hub with the flywheel pilot bearing, allowing the input shaft splines to pass cleanly through the disc on transmission installation. Without alignment, the transmission cannot be installed without damaging the disc, the pilot bearing, or the input shaft.
11. B — Cold-condensed moisture on glazed friction facings produces aggressive engagement during cold mornings that resolves as the engine reaches operating temperature and the moisture evaporates. The condition is most common with glazed surfaces that hold moisture. Once warm, the facings perform normally because the moisture has burned off.

DOMAIN B — TRANSMISSION

12. D — Jumping out of gear under load is a classic mechanical symptom of worn shift fork pads, weak detent springs, or worn engagement teeth that cannot maintain engagement under torque. Lubricant level affects wear over time but does not directly cause disengagement. Heavy-duty transmissions are non-synchronized, so synchronizer wear is not applicable.
13. C — Heavy-duty manual truck transmissions are non-synchronized, requiring drivers to double-clutch and match shaft speeds manually for clean engagement. Passenger car-style synchronizers cannot handle the torque levels of medium and heavy truck applications. Technician A's claim is incorrect for this class of equipment.
14. B — The slave valve interlocks the auxiliary range shift to require the main case to be in neutral, preventing range shifts under load that would damage the auxiliary planetary gears. This protection is essential because the range cylinder cannot complete a shift while the auxiliary section is transmitting torque.
15. A — Excessive countershaft endplay allows gears to shift axially during operation, creating misalignment between meshing teeth. This produces accelerated tooth wear, increased noise, and eventual bearing failure as load distribution becomes uneven across the gear set. Range engagement and gear-jump symptoms have different root causes.
16. D — Overdrive operation reduces engine RPM and transmission internal speed, lowering heat generation rather than increasing it. Plugged coolers, overfilled lubricant, and extended low-gear operation all increase friction or restrict cooling, producing overheating. Overdrive is the gear range least likely to overheat the transmission.

17. B — Range shifts use regulated air pressure from the truck's air supply system to actuate the auxiliary section. Splitter shifts on 13-speed and 18-speed transmissions provide additional intermediate ratios between standard shift positions, doubling effective gear count. Both technician statements describe correct system operation.
18. C — The X-Y shifter is the electromechanical actuator that physically moves the shift rails inside an automated manual transmission, with the X-axis selecting the rail and the Y-axis engaging the gear. It replaces the human driver's hand on the shift lever, executing gear selection commanded by the transmission ECM.
19. A — Smooth AMT downshift quality depends on coordinated engine and transmission ECM communication to match engine speed to the new gear ratio before re-engaging the clutch. Communication faults disrupt rev-matching and produce harsh engagement. Synchronizers are not used in AMTs based on heavy-duty manual designs.
20. C — ECT sensor errors affect engine fuel mixture but do not directly cause hard shifting in a manual transmission. Worn shift forks, insufficient air supply, and clutch brake misadjustment all directly produce hard shifting through their effect on engagement components. ECT is unrelated to the transmission shift mechanism.
21. D — A scan tool retrieves TCM fault codes and live operating data that point directly at the source of erratic shift behavior, whether it is sensor faults, actuator problems, electrical connections, or mechanical issues. Throttle linkage, blanket replacement, and voltage application have no place in proper AMT diagnosis.
22. A — A worn or maladjusted clutch brake fails to fully stop the input shaft when the pedal is to the floor, leaving residual rotation that causes the grinding sound during reverse engagement. The clutch brake is specifically designed to stop the input shaft for engaging starting gears from a stop, and its condition determines reverse engagement quality.
23. C — Twin countershafts split the transmitted torque between two parallel shafts rather than concentrating it on one, allowing the transmission to handle higher torque levels with smaller individual gear teeth. This design enables compact, high-capacity construction characteristic of medium and heavy truck applications.
24. B — ECT sensor errors affect engine fuel mixture but do not directly cause AMT clutch actuator slow engagement. Air supply problems, actuator wear, and contamination all directly affect the pneumatic actuator's ability to operate properly. ECT is unrelated to the AMT actuator mechanism.

DOMAIN C — DRIVESHAFT AND U-JOINTS

25. D — A missing balance weight creates rotating mass imbalance directly proportional to driveshaft speed, producing speed-dependent vibration that increases linearly with road speed. Slip joint wear, U-joint cap rotation, and corrosion may exist without producing the characteristic vibration of an imbalance condition.

26. A — Equal U-joint operating angles cause the velocity fluctuations introduced by each joint to cancel each other out at the driven shaft, producing smooth output. Steep angles produce excessive U-joint stress and shorter component life. Technician B's claim describes a setup that destroys driveline components.
27. C — A bound slip joint affects driveline length compensation and U-joint loading but does not affect engine braking, which operates through the engine and transmission rather than the driveshaft. Vibration during cycling, accelerated U-joint wear, and seal failure all directly result from a bound slip joint.
28. B — Phasing aligns the front and rear U-joint yokes on the same plane so that velocity fluctuations introduced by each joint cancel out. Out-of-phase yokes cause fluctuations to compound, generating torsional vibration that wears U-joints and other driveline components quickly during operation.
29. D — Any detectable movement of the cross within the yoke ears indicates worn bearing caps or an internally damaged cross, both of which require U-joint replacement. A proper U-joint should rotate freely on its trunnions but show zero radial play between the cross and yoke.
30. A — Driveshaft balance is critical to vibration-free operation. Replacing a U-joint changes rotating mass distribution slightly, potentially destroying the original balance. The resulting imbalance produces vibration that scales with road speed during normal operation, requiring rebalancing or careful alignment of new components.
31. B — The center support bearing carries the weight of a multi-piece driveshaft at the connection point and isolates road-induced vibration from the chassis through its rubber mount. It does not provide constant velocity, dampen torsion, or accommodate length changes — those functions belong to other components.

DOMAIN D — DRIVE AXLE

32. D — Excessive ring-and-pinion backlash allows gear teeth to separate slightly under no load and slam together when torque is applied, producing the characteristic clunk during throttle transitions. Pinion preload affects bearing wear, endplay affects bearing life, and crossmember bolts produce body or ride noise instead.
33. A — The inter-axle differential allows the forward-rear and rear-rear drive axles to rotate at different speeds during turns, when tires have unequal wear, or when surface conditions vary. Without this differential action, the drivetrain would bind and stress driveline components on dry pavement at speed during cornering.
34. C — The IAD lock should only be engaged at low speeds on slick or off-road surfaces where wheel slip prevents normal traction. Engaging it on dry pavement at speed forces both axles to rotate at exactly the same speed, generating extreme drivetrain stress, tire scuffing, and progressive component damage.

35. D — IAD lock engagement actually changes power flow distribution but does not significantly affect rolling resistance at the tire-to-road interface. Drivetrain windup, tire scuffing, and progressive component damage are all direct, measurable consequences of the locked condition. Fuel economy effects are negligible compared to the mechanical damage.
36. B — Rotational drag torque measured with a beam-type torque wrench provides the most accurate indication of bearing preload during pinion installation. Counting turns is imprecise, visual inspection cannot quantify load, and endplay measurement is for completed assemblies, not for setting initial preload during the rebuild process.
37. C — Gear oil contamination of brake friction material cannot be removed by cleaning because oil penetrates the porous friction surface and bleeds back out under heat during operation. Both the wheel seal and all contaminated friction components must be replaced to restore proper braking function and safety margins.
38. A — ECT sensor errors affect engine fuel mixture but do not produce drive axle whining noise. Worn ring-and-pinion gears, improper gear mesh, and IAD bearing damage all produce speed-dependent noise originating in the drive axle assembly. ECT is unrelated to drive axle mechanical components.
39. B — Ring-and-pinion sets are factory-lapped together to achieve specific tooth contact patterns, and replacing only one component produces mismatched contact surfaces that wear quickly and generate noise. Both Technician A's manufacturing principle and Technician B's wear pattern explanation are correct.
40. D — Zero detectable endplay indicates a preload condition where bearings carry continuous axial load even when the wheel is at rest, generating heat and shortening bearing life dramatically. Heavy-duty wheel bearings require a small specified endplay (typically 0.001–0.005 inch) for proper operation per TMC RP 618.