PRACTICE EXAM 4: T3 SIMULATION (40 QUESTIONS)

DOMAIN A — CLUTCH (Questions 1–11)

1. A heavy-duty clutch with proper external pedal free play but insufficient internal adjustment will most likely produce:

A. Excessive pedal effort during normal shift operations

B. Failure of the engine to start after the clutch is replaced

C. Loss of the clutch brake function during reverse engagement

D. Slip under load even with the clutch facings in good condition

2. The progressive failure pattern of a clutch operating with continuous oil contamination begins with:

A. Pressure plate spring fracture from excessive thermal cycling

B. Glazing of the friction surfaces, followed by chatter, then slippage

C. Pilot bearing seizure from contamination in the engine oil supply

D. Release bearing failure within hours of contamination exposure

3. The LEAST likely outcome of operating a heavy-duty truck for extended periods with insufficient clutch pedal free play is:

A. Pilot bearing seizure from continuous loading by the input shaft

B. Release bearing wear from continuous contact with pressure plate fingers

C. Clutch slippage from reduced clamping force on the driven disc

D. Premature clutch facing wear from partial engagement during operation

4. A clutch that disengages partway through pedal travel rather than at the bottom indicates:

A. Excessive flywheel runout requiring flywheel resurfacing service

B. Failed pilot bearing requiring complete clutch assembly removal

C. Internal adjustment out of specification on the pressure plate

D. Worn clutch brake material requiring immediate replacement

5. When a heavy-duty clutch master cylinder primary seal fails, the symptom typically manifests as:

A. Clutch pedal that feels normal but produces grinding during shifts

B. Clutch chatter during initial engagement from a stop position

C. Slippage under heavy load that improves with engine warm-up

D. Pedal that sinks slowly under steady foot pressure during operation

6. A driver complaint of clutch grab during initial engagement after the truck warms up most likely indicates:

A. Glazed friction facings combined with thermal expansion of components

B. Excessive clutch pedal free play allowing partial release at bottom

C. Failed pilot bearing producing chatter during clutch engagement

D. Worn release bearing causing uneven contact with pressure plate fingers

7. The proper torque sequence for a heavy-duty clutch pressure plate to flywheel installation is:

A. Maximum torque applied to one bolt before moving to the next

B. Star pattern in stages, building from initial torque to final specification

C. Outer perimeter first, then working inward toward the center bolts

D. Random sequence as long as final torque meets the specification

8. The most accurate description of a self-adjusting clutch design is:

A. Manual adjustment performed at fixed mileage intervals during service

B. Hydraulic compensation that prevents any wear during normal operation

C. Internal mechanism that compensates for facing wear automatically

D. Electronic compensation controlled by the engine ECM during operation

9. A pull-type clutch that develops a sudden release problem after replacement of the slave cylinder most likely indicates:

A. Defective replacement cylinder requiring warranty replacement immediately

B. Improper bench bleeding before installation causing system contamination

C. Wrong cylinder bore size for the application during the parts purchase

D. Air introduced during installation that requires proper bleeding procedure

10. When inspecting a clutch removed from service, blue discoloration on the friction surfaces indicates:

A. Excessive heat from extended slipping or improper engagement during use

B. Normal break-in coloration that develops within the first thousand miles

C. Manufacturing surface treatment applied during the original production

D. Lubricant contamination from a transmission input shaft seal failure

11. The pressure plate fingers on a heavy-duty pull-type clutch are operated by:

A. Direct mechanical force from the clutch pedal through the linkage

B. Hydraulic pressure applied through the slave cylinder during disengagement

C. Release bearing contact pulling fingers rearward to release clamping force

D. Springs that retract the fingers when the pedal is released to floor

DOMAIN B — TRANSMISSION (Questions 12–24)

12. A heavy-duty transmission produces a high-pitched whine that is present in all forward gears but absent in neutral. The most likely source is:

A. Worn input shaft bearings carrying load in all power flow conditions

B. Worn shift forks affecting gear engagement during operation

C. Worn synchronizer rings producing noise during gear changes only

D. Failed clutch brake producing noise when input shaft rotates freely

13. The progression of bearing failure in a heavy-duty manual transmission typically follows this pattern:

A. Sudden catastrophic failure with no warning during normal operation

B. Visible external leakage followed by gradual gear engagement difficulty

C. Loss of all forward gears simultaneously requiring immediate service

D. Initial noise increase, followed by metal in lubricant, then progressive damage

14. The LEAST likely cause of a heavy-duty manual transmission that produces noise only during deceleration is:

A. Worn countershaft bearings carrying load during deceleration only

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

C. Worn output shaft bearings affected by reverse load conditions

D. Damaged main shaft components contacting case during deceleration

15. A transmission lubricant analysis shows elevated copper levels with normal iron levels. The most likely source is:

A. Excessive wear on the output shaft splines during normal operation

B. Worn ring and pinion gears in the rear drive axle assembly

C. Bushing wear from shift fork pads or other bronze components

D. Contaminated lubricant from improper service procedure during fill

16. When a 13-speed transmission fails to complete a splitter shift consistently, the diagnostic priority is:

A. Verify air supply pressure and inspect the splitter cylinder operation

B. Replace the entire transmission as preventive maintenance procedure

C. Apply battery voltage to the splitter components for diagnostic testing

D. Adjust the throttle linkage at the engine for proper shift completion

17. The most likely consequence of operating a heavy-duty manual transmission with low lubricant level for extended periods is:

A. Range cylinder failure from inadequate pneumatic pressure during shifts

B. Synchronizer ring wear from excessive operation during normal shifts

C. Clutch brake wear from increased shifting effort by the driver

D. Bearing failure followed by gear damage from inadequate lubrication

18. A heavy-duty AMT that fails to start in motion (creeps when shifted to drive) most likely indicates:

A. Worn synchronizer rings preventing first gear engagement during launch

B. Clutch actuator unable to fully disengage clutch during launch sequence

C. Failed coolant temperature sensor reading falsely cold to the engine ECM

D. Worn gear teeth in first gear preventing proper torque transmission

19. The proper diagnostic approach when an AMT fault code references the input shaft speed sensor is to:

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

B. Replace the sensor immediately as the most likely failure component

C. Replace the TCM as the primary repair for sensor-related fault codes

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

20. The shift fork pad on a heavy-duty manual transmission typically wears due to:

A. Excessive transmission lubricant level above the maximum mark

B. Improper driver technique during shift operations

C. Continuous contact and friction with the gear sliding clutch surface

D. Age-related material deterioration regardless of operating conditions

21. The maximum allowable shift fork wear on most heavy-duty transmission applications is typically:

A. 0.005 to 0.010 inches across the contact pad surface

B. 0.030 to 0.060 inches across the contact pad surface

C. 0.100 to 0.150 inches across the contact pad surface

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

22. When a heavy-duty transmission jumps out of high range under load, the most likely cause is:

A. Insufficient air supply pressure during normal highway operation

B. A failed coolant temperature sensor affecting shift control timing

C. Worn synchronizer in the high range section of the transmission

D. Worn range cylinder, range valve, or auxiliary section detent components

23. The proper procedure when reusing a transmission case during rebuild includes:

A. Inspecting bore conditions, mating surfaces, and bolt threads for damage

B. Visual inspection of the exterior only without internal verification

C. Replacement of the case regardless of condition during rebuild

D. Applying gasket sealer to all mating surfaces during reassembly

24. A heavy-duty transmission that whines only when accelerating but is silent on coast typically indicates wear in the:

A. Input shaft bearing closest to the engine flywheel during operation

B. Output shaft bearing closest to the driveshaft yoke during operation

C. Drive-side gear flanks that carry load during acceleration only

D. Synchronizer rings affected during normal gear engagement

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

25. The progressive damage pattern from a binding slip joint typically manifests as:

A. Immediate U-joint failure within hours of the bind condition developing

B. Vibration during suspension cycling, then U-joint wear, then yoke damage

C. Loss of drivetrain power output requiring immediate shutdown procedures

D. Catastrophic driveshaft separation during normal operation conditions

26. When a heavy-duty driveshaft develops a vibration that occurs only during acceleration, the most likely cause is:

A. Driveshaft tube damage from external impact during operation

B. Center support bearing failure with broken rubber isolation mount

C. U-joint cap bearing rotation visible during physical inspection

D. Driveline angle change under torque from suspension geometry shift

27. The proper specification range for U-joint operating angle differential between front and rear joints is typically:

A. Less than 1 degree difference between the two joint angles

B. 3 to 5 degrees difference for proper vibration cancellation

C. 5 to 10 degrees difference is acceptable for normal operation

D. No specification; angles can be set independently of each other

28. A heavy-duty truck driveshaft inspection reveals U-joint bearing caps that rotate freely when grasped by hand. The most likely cause is:

A. Insufficient grease in the U-joint requiring immediate lubrication

B. Worn yoke ears that no longer hold the bearing caps in proper position

C. Loose retaining straps, U-bolts, or snap rings holding the caps

D. Normal break-in condition requiring no service action during inspection

29. The LEAST likely consequence of an improperly phased two-piece driveshaft is:

A. Torsional vibration that increases with road speed during operation

B. Premature transmission output shaft seal failure from radial forces

C. Accelerated U-joint wear from continuous velocity fluctuations

D. Center support bearing rubber mount fatigue from absorbed vibration

30. The most accurate measurement technique for verifying driveline operating angles is to:

A. Apply battery voltage to the driveshaft for electronic measurement

B. Estimate visually using shop lighting during the inspection process

C. Use a stethoscope to detect angle-related vibrations during operation

D. Use an inclinometer at multiple reference points along the driveline

31. A driveshaft removed from service shows surface galling on the slip joint splines. The most likely cause is:

A. Normal wear from extended service that requires no action during inspection

B. Excessive operating angles forcing the splines into binding contact

C. Inadequate lubrication causing metal-to-metal contact during travel

D. Manufacturing defect in the spline machining that should be returned

DOMAIN D — DRIVE AXLE (Questions 32–40)

32. A drive axle that produces noise only when transitioning from drive to coast indicates:

A. Backlash exceeding service specification in the ring and pinion mesh

B. Worn pinion bearings affected only during reverse load conditions

C. Damaged differential side gears affecting torque transmission

D. Wheel bearing wear on the loaded side during cornering operation

33. The progressive damage pattern from continuously low gear oil level in a heavy-duty drive axle typically begins with:

A. Sudden gear set failure with no warning during operation

B. Wheel bearing failure followed by complete axle assembly damage

C. Differential cover warpage requiring immediate replacement during service

D. Bearing overheating, then gear tooth damage, then catastrophic failure

34. When a heavy-duty drive axle wheel seal fails progressively, the typical symptom sequence is:

A. Sudden brake failure on the affected side without prior warning

B. Trace leakage, then visible drip, then brake contamination if ignored

C. Loss of wheel bearing preload requiring immediate adjustment service

D. Differential noise change followed by ring gear failure within hours

35. The proper torque application sequence for differential carrier cap bolts is:

A. Single-pass maximum torque applied to each bolt in numerical order

B. Star pattern at maximum specification during the initial installation

C. Multiple passes in star pattern, building from initial to final torque

D. Random sequence with final verification using a calibrated torque wrench

36. A heavy-duty drive axle that shows uneven ring gear tooth contact pattern indicates:

A. Improper pinion depth requiring shim adjustment during service

B. Normal wear pattern that develops during break-in operation

C. Excessive backlash that should be eliminated through bearing replacement

D. Differential carrier preload at minimum specification requiring increase

37. The progression of damage from operating with the IAD lock engaged on dry pavement at highway speeds typically begins with:

A. Sudden axle separation requiring immediate vehicle shutdown

B. Tire scuffing and drivetrain windup, then bearing damage, then component failure

C. Differential cover failure within minutes of engagement at speed

D. Loss of all forward gear engagement requiring transmission service

38. The LEAST likely cause of drive axle gear oil contamination with metallic particles is:

A. Normal wear between meshing ring and pinion gear teeth surfaces

B. Wheel bearing wear allowing particles into the differential housing

C. Inter-axle differential bearing failure on tandem drive applications

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

39. The proper procedure when a heavy-duty drive axle requires complete bearing replacement is:

A. Replace bearings only without disturbing the ring and pinion mesh setup

B. Apply battery voltage to the components for diagnostic testing during service

C. Reset all preload, depth, and backlash specifications during reassembly

D. Reuse existing shims regardless of bearing replacement during the rebuild

40. When a tandem drive axle develops a noise pattern that varies between forward-rear and rear-rear positions, the diagnostic priority is to:

A. Replace both axle assemblies as preventive maintenance procedure

B. Isolate the noise source through systematic component testing on each unit

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

D. Listen with a stethoscope without any disassembly of the affected unit

ANSWER KEY AND EXPLANATIONS

DOMAIN A — CLUTCH

1. D — Insufficient internal adjustment causes the clutch to remain partially engaged even when the pedal is fully released because the pressure plate fingers are too far from the release bearing. The reduced clamping force allows slippage under load even with serviceable facings. External free play affects release; internal adjustment affects engagement clamping force.

2. B — Oil contamination produces a predictable failure progression: first glazing as oil reduces friction unevenly, then chatter during engagement as the contaminated surfaces grab inconsistently, then slippage as the friction coefficient degrades below what's needed to transmit engine torque. Each stage progresses to the next without intervention.

3. A — Pilot bearing seizure is not a typical consequence of insufficient free play. Insufficient free play keeps the release bearing in continuous contact with pressure plate fingers, causing release bearing wear, partial clutch engagement, facing wear from slippage, and eventual clamping force reduction. The pilot bearing operates independently of release bearing position.

4. C — When internal adjustment is out of specification, the clutch disengages partway through pedal travel rather than at the bottom. This indicates the pressure plate fingers are too close to the release bearing, causing early disengagement. Proper adjustment positions disengagement to occur near the bottom of pedal travel.

5. D — Master cylinder primary seal failure allows fluid to bypass the seal under steady pressure, producing a pedal that sinks slowly while held in the depressed position. The slow sink is the diagnostic signature of internal seal bypass, distinct from external leakage which produces visible fluid loss.

6. A — Glazed friction facings combined with thermal expansion produce grab during initial engagement after warm-up. The expanded components contact the glazed surfaces with high friction coefficient at certain points, producing the characteristic grab. Cold operation does not show the symptom because thermal expansion has not yet occurred.

7. B — Pressure plate bolts are torqued in a star pattern in stages, progressing from initial torque (typically 25–30 ft-lbs) to final specification across multiple passes. This sequence ensures even clamping force across the assembly without distortion. Single-pass maximum torque or random sequences cause distortion and uneven clamping.

8. C — Self-adjusting clutch designs use an internal mechanism (typically a ratcheting pressure plate or wear-compensating spring system) that compensates for facing wear automatically. This

eliminates the need for periodic manual internal adjustment, extending service intervals. The mechanism activates as wear occurs, maintaining proper clamping force throughout service life.

9. D — Air introduction during slave cylinder installation is the most common cause of release problems immediately following replacement. Any time the hydraulic system is opened, air enters the lines and must be properly bled to restore solid hydraulic transmission of pedal force. Improper bleeding produces a spongy pedal and incomplete release.

10. A — Blue discoloration on clutch friction surfaces indicates excessive heat from extended slipping or improper engagement. The temperatures required to produce blue oxidation (typically 600°F+) cannot occur during normal operation; they indicate a service problem such as riding the clutch, inadequate clamping force, or improper driver technique.

11. C — Pull-type pressure plate fingers are operated by release bearing contact that pulls the fingers rearward (away from the pressure plate body), reducing clamping force on the driven disc. This is the opposite of push-type designs where the release bearing pushes the fingers inward. Most modern heavy-duty applications use pull-type designs.

DOMAIN B — TRANSMISSION

12. A — A high-pitched whine in all forward gears with silence in neutral indicates input shaft bearing wear because the input shaft carries load only when the clutch is engaged and a forward gear is selected. In neutral, the input shaft rotates but carries minimal load, so worn bearings produce noise only when loaded. Synchronizers are not used in heavy-duty transmissions.

13. D — Heavy-duty transmission bearing failure follows a predictable progression: initial noise increase as bearings wear, then metal particles in the lubricant from accelerated wear, then progressive damage as failed bearings contaminate gear meshes and other bearings. Recognition of the early stages prevents catastrophic failure.

14. B — ECT sensor errors affect engine fuel mixture but not transmission operation. The other choices all describe transmission components that bear load during deceleration: countershaft bearings carry reverse load, output shaft bearings handle thrust direction reversal, and main shaft components carry deceleration forces.

15. C — Elevated copper with normal iron levels indicates wear of bronze components in the transmission. Shift fork pads, certain bushings, and synchronizer assemblies (in transmissions that have them) commonly use bronze materials. Normal iron levels indicate the gears and shafts are not yet showing accelerated wear.

16. A — Splitter shift problems on a 13-speed transmission begin with verification of air supply pressure and splitter cylinder operation. The pneumatic system must deliver adequate pressure for the splitter cylinder to complete its stroke; insufficient pressure or component damage produces inconsistent shift completion. This diagnostic priority addresses the most common causes first.

17. D — Low lubricant level produces bearing failure first because bearings receive less splash lubrication than gears. Failed bearings produce metal contamination that damages gear teeth, eventually causing complete gear set failure if not addressed. The sequence (bearing wear → gear damage → complete failure) is consistent across heavy-duty transmissions.

18. B — An AMT that creeps when shifted to drive (instead of starting in motion smoothly) indicates the clutch actuator cannot fully disengage the clutch. Partial engagement transmits enough torque to create creep when stopped and reduces launch quality. Worn synchronizer rings and gear teeth are not factors in AMTs based on heavy-duty manual designs.

19. A — Input shaft speed sensor diagnosis begins with scan tool verification of sensor signal, then inspection of wiring and sensor mounting. The sensor may be functional with damaged wiring or mounting, or may be faulty itself. Verification of signal first determines whether the sensor or the wiring is the actual problem before parts replacement.

20. C — Shift fork pads wear from continuous contact and friction with the sliding clutch (the toothed component that engages gears). Each shift cycles the fork pad against the sliding clutch surface, producing gradual wear over many cycles. Lubricant level affects rate of wear; driver technique has minimal effect on fork pad wear specifically.

21. A — Maximum allowable shift fork wear on most heavy-duty transmissions is typically 0.005 to 0.010 inches across the contact pad surface. Wear beyond this specification produces poor engagement, jumping out of gear, and accelerated synchronizer or gear damage. Manufacturers specify the exact limit in service information.

22. D — Jumping out of high range under load indicates wear in the components that hold the range cylinder in position under load: the range cylinder itself, the range valve, or the auxiliary section detent components. Each of these can fail to maintain range engagement when high torque is applied through the transmission.

23. A — Transmission case reuse during rebuild requires inspection of bore conditions (for bearings to seat properly), mating surfaces (for proper sealing), and bolt threads (for proper torque retention). Cases with damage in any of these areas may produce leakage, bearing failure, or fastener problems. Visual inspection alone is inadequate for verifying reusability.

24. C — Whine only during acceleration indicates wear on the drive-side gear flanks (the surfaces that carry load during acceleration). Each gear tooth has two flanks: drive-side (loaded during acceleration) and coast-side (loaded during deceleration). Drive-side wear produces noise only when accelerating; coast-side wear produces noise only when decelerating.

DOMAIN C — DRIVESHAFT AND U-JOINTS

25. B — Binding slip joint damage progresses from vibration during suspension cycling (the bound joint cannot accommodate length changes), to U-joint wear (joints absorb the axial loading the slip

joint cannot), to yoke damage (continued stress eventually fatigues the yoke material). Recognition of vibration during suspension cycling allows intervention before more serious damage.

26. D — Driveshaft vibration only during acceleration indicates a driveline angle change under torque. As torque is applied, suspension geometry shifts slightly under axle wind-up, changing U-joint operating angles. This produces acceleration-only vibration that resolves on coast when torque is released. The problem is unique to under-load conditions.

27. A — Front and rear U-joint operating angles should differ by less than 1 degree for proper vibration cancellation. Equal angles allow the velocity fluctuations introduced by each joint to cancel each other through the driveshaft rotation. Differences greater than 1 degree allow fluctuations to compound, producing torsional vibration.

28. C — Loose retaining straps, U-bolts, or snap rings allow the bearing caps to rotate freely in the yoke ears. The retainers hold the caps in proper position; when retainers loosen or fail, the caps work loose and rotate, eventually escaping the yoke entirely. This is a serious safety condition that must be addressed immediately.

29. B — Improper driveshaft phasing produces torsional vibration but does not directly cause transmission output shaft seal failure. The other choices all describe direct consequences: torsional vibration scales with speed, U-joints wear from fluctuations, and center support rubber fatigues from absorbed vibration. Seal failure typically requires radial forces, not the torsional forces phasing creates.

30. D — Inclinometer measurements at multiple reference points along the driveline (transmission output yoke, driveshaft tube, axle pinion yoke) provide accurate angle measurements. The angles are then compared to specification for proper geometry. Voltage testing, visual estimation, and stethoscope measurement cannot quantify driveline angles.

31. C — Surface galling on slip joint splines indicates inadequate lubrication that allowed metal-to-metal contact during length changes. Proper lubrication maintains a film between the spline surfaces; without lubrication, the splines contact directly under load, producing galling that worsens progressively until the joint fails or binds.

DOMAIN D — DRIVE AXLE

32. A — Noise that occurs only during the transition from drive to coast indicates excessive ring-and-pinion backlash. The backlash allows the gear teeth to separate slightly during the transition, then slam back together as the load direction reverses. Proper backlash holds the teeth in close mesh through the transition without separation.

33. D — Low gear oil progression begins with bearing overheating (bearings receive less lubrication than gears), then gear tooth damage (heat damages tooth surfaces and contaminated oil accelerates wear), then catastrophic failure (failed bearings contaminate the gear set, causing complete drivetrain failure). Each stage progresses to the next without intervention.

34. B — Wheel seal failure progresses from trace leakage (oil weeping around the seal), to visible drip (significant oil loss visible during inspection), to brake contamination if ignored (oil reaches the brake friction surfaces, requiring full friction component replacement). Recognition of the early stages prevents the brake contamination phase.

35. C — Differential carrier cap bolts use multiple passes in star pattern, building from initial torque (typically 30–40 ft-lbs) to final specification. This sequence ensures even bearing seating and proper preload across the carrier assembly. Single-pass maximum torque distorts the carrier; random sequences produce uneven preload.

36. A — Uneven ring gear tooth contact pattern indicates improper pinion depth that requires shim adjustment. The pattern shows whether the pinion is too shallow (heel contact) or too deep (toe contact); adjustment shims behind the pinion bearing race correct the depth to produce even tooth contact across the gear face.

37. B — IAD lock damage on dry pavement at highway speeds progresses from tire scuffing and drivetrain windup (immediate effects of forced equal axle speed), to bearing damage (continuous stress on driveline components), to component failure (fatigue from continuous unrelieved windup). Each stage progresses to the next with continued operation.

38. D — ECT sensor errors affect engine fuel mixture but do not produce metallic particles in drive axle gear oil. The other choices all describe direct sources of metal contamination in the differential housing. ECT is unrelated to drive axle mechanical components or lubricant condition.

39. C — Complete bearing replacement requires resetting all preload, depth, and backlash specifications during reassembly. The new bearings have different dimensions that affect ring gear position and pinion depth, requiring complete setup verification. Reusing existing shims or skipping setup produces improper mesh and accelerated wear.

40. B — Tandem drive axle noise that varies between positions requires systematic isolation through component testing on each unit. The differential housings, bearings, and gear sets in each axle can produce noise; identifying which axle is the source requires isolation testing rather than blanket replacement or visual inspection alone.