



# Entry-Level Certification Program

## TEST SPECIFICATIONS AND TASK LISTS

### M/H TRUCK SERIES

(2018)

The task lists and test specifications for the each of the four individual tests below are derived directly from the current Instruction Standard for ASE program accreditation.

The task lists are simply listings of the tasks involved in servicing and repair of various vehicle systems. Each question in a test is keyed to one or more of these tasks. The task lists are organized into content categories, and these content categories, along with the number of questions included in each category, comprise the test specifications. Every form of the exams meets these specifications.

Tests may include additional, unscored questions for statistical evaluation. Extra questions will not count for or against the final score. However, since they are not identified, candidates should answer every question to the best of their ability.

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#### NOTE: THE NEW INSPECTION, MAINTENANCE, AND MINOR REPAIR TEST

- The Inspection, Maintenance, and Minor Repair test is being offered for the first time spring 2019 and WILL NOT be instantly scored. Results will be posted to the student's and school's accounts in early June, 2019.
- Please also be aware -- this test has twice the number of test questions than normal (i.e. 120 questions rather than the normal 60).
- ASE recommends that students be scheduled at least two hours for this test. Students who need extra time will be allowed a total of three hours if needed.
- Due to the logistics of introducing a new test title, students will NOT be given a second opportunity to take this test this year. That is, there is no option this school year for a retest.

## DIESEL ENGINES

Content Area	Questions In Test
A. General	7
B. Cylinder Head and Valve Train	4
C. Engine Block	3
D. Lubrication System	4
E. Cooling System	7
F. Air Induction, Exhaust Systems and Engine Brakes	7
G. Fuel System	8
Required To Pass: 21 of 40	40

Notes:

This test may include additional questions for statistical evaluation. Extra questions will not count for or against the final score. Since the extra questions are not identified, test candidates should answer every question to the best of their ability.

### A. General

1. Inspect fuel, oil, and coolant levels, and condition; determine needed action.
2. Identify the causes of engine fuel, oil, coolant, air, and other leaks; determine needed action.
3. Listen for engine noises; determine needed action.
4. Observe engine exhaust smoke color and quantity; determine needed action.
5. Identify causes of no cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed action.
6. Identify causes of surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action.
7. Identify engine vibration problems; determine needed action.
8. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; verify customer programmable parameters; clear codes; determine further diagnosis.

### B. Cylinder Head and Valve Train

1. Remove, clean, inspect for visible damage, and replace cylinder head(s) assembly.
2. Clean and inspect threaded holes, studs, and bolts for serviceability; determine needed action.
3. Inspect cylinder head for cracks/damage; check mating surfaces for warpage; check condition of passages; inspect core/expansion and gallery plugs; determine needed action.
4. Disassemble head and inspect valves, guides, seats, springs, retainers, rotators, locks, and seals; determine needed action.
5. Measure valve head height relative to deck and valve face-to-seat contact; determine needed action.
6. Inspect injector sleeves and seals; measure injector tip or nozzle protrusion; determine needed action.
7. Inspect valve train components; determine needed action.
8. Reassemble cylinder head.
9. Inspect, measure, and replace/reinstall overhead camshaft; measure/adjust end play and backlash.
10. Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness; determine needed action.
11. Adjust valve bridges (crossheads); adjust valve clearances and injector settings.

### C. Engine Block

1. Perform crankcase pressure test; determine needed action.
2. Remove, inspect, service, and install pans, covers, gaskets, seals, wear rings, and crankcase ventilation components.
3. Disassemble, clean, and inspect engine block for cracks/damage; measure mating surfaces for warpage; check condition of passages, core/expansion and gallery plugs; inspect threaded holes, studs, dowel pins, and bolts for serviceability; determine needed action.

4. Inspect cylinder sleeve counterbore and lower bore; check bore distortion; determine needed action.
5. Clean, inspect, and measure cylinder walls or liners for wear and damage; determine needed action.
6. Replace/reinstall cylinder liners and seals; check and adjust liner height (protrusion).
7. Inspect in-block camshaft bearings for wear and damage; determine needed action.
8. Inspect, measure, and replace/reinstall in-block camshaft; measure/adjust end play.
9. Clean and inspect crankshaft for surface cracks and journal damage; check condition of oil passages; check passage plugs; measure journal diameter; determine needed action.
10. Inspect main bearings for wear patterns and damage; replace as needed; check bearing clearances; check and correct crankshaft end play.
11. Inspect, install, and time gear train; measure gear backlash; determine needed action.
12. Inspect connecting rod and bearings for wear patterns; measure pistons, pins, retainers, and bushings; perform needed action.
13. Determine piston-to-cylinder wall clearance; check ring-to-groove fit and end gap; install rings on pistons.
14. Assemble pistons and connecting rods; install in block; install rod bearings and check clearances.
15. Check condition of piston cooling jets (nozzles); determine needed action.
16. Inspect and measure crankshaft vibration damper; determine needed action.
17. Install and align flywheel housing; inspect flywheel housing(s) to transmission housing/engine mating surface(s) and measure flywheel housing face and bore runout; determine needed action.
18. Inspect flywheel/flexplate (including ring gear) and mounting surfaces for cracks and wear; measure runout; determine needed action.

#### **D. Lubrication Systems**

1. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor; determine needed action.
2. Check engine oil level, condition, and consumption; determine needed action.
3. Inspect and measure oil pump, drives, inlet pipes, and pick-up screens; check drive gear clearances; determine needed action.
4. Inspect oil pressure regulator valve(s), by-pass and pressure relief valve(s), oil thermostat, and filters; determine needed action.
5. Inspect, clean, and test oil cooler and components; determine needed action.
6. Inspect turbocharger lubrication and cooling systems; determine needed action.
7. Determine proper lubricant and perform oil and filter change.

#### **E. Cooling System**

1. Check engine coolant type, level, condition, and consumption; test coolant for freeze protection and additive package concentration; determine needed action.
2. Test coolant temperature and check operation of temperature and level sensors, gauge, and/or sending unit; determine needed action.
3. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
4. Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed.
5. Recover, flush, and refill with recommended coolant/additive package; bleed cooling system.
6. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.
7. Inspect water pump and hoses; replace as needed.
8. Inspect, clean, and pressure test radiator, pressure cap, tank(s), and recovery systems; determine needed action.
9. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed.

## **F. Air Induction, Exhaust Systems and Engine Brakes**

1. Perform air intake system restriction and leakage tests; determine needed action.
2. Perform intake manifold pressure (boost) test; determine needed action.
3. Perform exhaust back pressure test; determine needed action.
4. Inspect turbocharger(s), wastegate, and piping systems; determine needed action.
5. Inspect and test turbocharger(s) (variable ratio/geometry VGT), pneumatic, hydraulic, electronic controls, and actuators.
6. Check air induction system: piping , hoses, clamps, and mounting; service or replace air filter as needed.
7. Remove and reinstall turbocharger/wastegate assembly.
8. Inspect intake manifold, gaskets, and connections; replace as needed.
9. Inspect, clean, and test charge air cooler assemblies; inspect aftercooler assemblies; replace as needed.
10. Inspect exhaust manifold, piping, mufflers, and mounting hardware; repair or replace as needed.
11. Inspect exhaust after treatment devices; determine necessary action.
12. Inspect and test preheater/inlet air heater, or glow plug system and controls; perform needed action.
13. Inspect and test exhaust gas recirculation (EGR) system including EGR valve, cooler, piping, filter, electronic sensors, controls, and wiring; determine needed action.
14. Inspect and adjust engine compression/exhaust brakes; determine needed action.
15. Inspect, test, and adjust engine compression/exhaust brake control circuits, switches, and solenoids; repair or replace as needed.
16. Inspect engine compression/exhaust brake housing, valves, seals, lines, and fittings; repair or replace as needed.

## **G. Fuel System**

### **1. Fuel Supply System**

1. Check fuel level, and condition; determine needed action.
2. Perform fuel supply and return system tests; determine needed action.
3. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, supply and return lines and fittings; determine needed action.
4. Inspect, clean, and test fuel transfer (lift) pump, pump drives, screens, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates, and mounting hardware; determine needed action.
5. Inspect and test low pressure regulator systems (check valves, pressure regulator valves, and restrictive fittings); determine needed action.
6. Check fuel system for air; determine needed action; prime and bleed fuel system; check primer pump.

### **2. Electronic Fuel Management System**

1. Inspect and test power and ground circuits and connections; measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM); determine needed action.
2. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (to include PC based software and/or data scan tools); determine needed action.
3. Check and record electronic diagnostic codes and trip/operational data; monitor electronic data; clear codes; determine further diagnosis.
4. Locate and use relevant service information (to include diagnostic procedures, flow charts, and wiring diagrams).
5. Inspect and replace electrical connector terminals, seals, and locks.

6. Inspect and test switches, sensors, controls, actuator components, and circuits; adjust or replace as needed.
7. Using recommended electronic diagnostic tools (to include PC based software and/or data scan tools), access and interpret customer programmable parameters.
8. Inspect, test, and adjust electronic unit injectors (EUI); determine needed action.
9. Remove and install electronic unit injectors (EUI) and related components; recalibrate ECM (if applicable).
10. Perform cylinder contribution test utilizing recommended electronic diagnostic tool.
11. Perform on-engine inspections and tests on hydraulic electronic unit injectors and system electronic controls; determine needed action.
12. Perform on-engine inspections and tests on hydraulic electronic unit injector high pressure oil supply and control systems; determine needed action.
13. Perform on-engine inspections and tests on common rail type injection systems; determine needed action.
14. Inspect high pressure injection lines, hold downs, fittings and seals; determine needed action.

## ELECTRICAL/ELECTRONIC SYSTEMS

Content Area	Questions In Test
A. General Electrical Systems	9
B. Battery	4
C. Starting Systems	6
D. Charging System Diagnosis and Repair	5
E. Lighting Systems	5
F. Gauges and Warning Devices	4
G. Related Electrical Systems	7
Required To Pass: 21 of 40	TOTAL 40

Notes:

This test may include additional questions for statistical evaluation. Extra questions will not count for or against the final score. Since the extra questions are not identified, test candidates should answer every question to the best of their ability.

### A. General Electrical Systems

1. Read and interpret electrical/electronic circuits using wiring diagrams.
2. Check continuity in electrical/electronic circuits using appropriate test equipment.
3. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.
4. Check current flow in electrical/electronic circuits and components using appropriate test equipment.
5. Check resistance in electrical/electronic circuits and components using appropriate test equipment.
6. Locate shorts, grounds, and opens in electrical/electronic circuits.
7. Identify parasitic (key-off) battery drain problems; perform tests; determine needed action.
8. Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.
9. Inspect and test spike suppression devices; replace as needed.
10. Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.

### B. Battery

1. Perform battery load test; determine needed action.
2. Determine battery state of charge using an open circuit voltage test.
3. Inspect, clean, and service battery; replace as needed.
4. Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.
5. Charge battery using slow or fast charge method as appropriate.
6. Inspect, test, and clean battery cables and connectors; repair or replace as needed.
7. Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures.
8. Perform battery capacitance test; determine needed action.

### C. Starting System

1. Perform starter circuit cranking voltage and voltage drop tests; determine needed action.
2. Inspect and test components (key switch, push button and/or magnetic switch) and wires in the starter control circuit; replace as needed.
3. Inspect and test, starter relays and solenoids/switches; replace as needed.
4. Remove and replace starter; inspect flywheel ring gear or flex plate.

#### **D. Charging System Diagnosis and Repair**

1. Test instrument panel mounted volt meters and/or indicator lamps; determine needed action.
2. Identify causes of a no charge, low charge, or overcharge problems; determine needed action.
3. Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment.
4. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.
5. Perform charging circuit voltage drop tests; determine needed action.
6. Remove and replace alternator.
7. Inspect, repair, or replace cables, wires, and connectors in the charging circuit.

#### **E. Lighting Systems**

1. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action.
2. Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.
3. Test, aim, and replace headlights.
4. Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.
5. Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, wires, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed.
6. Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.
7. Inspect and test interior cab light circuit switches, bulbs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed.
8. Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.
9. Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
10. Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.
11. Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed.

#### **F. Gauges and Warning Devices**

1. Interface with vehicle's on-board computer; perform diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action.
2. Identify causes of intermittent, high, low, or no gauge readings; determine needed action.
3. Identify causes of data bus-driven gauge malfunctions; determine needed action.
4. Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.
5. Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed.
6. Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.

## **G. Related Electrical Systems**

1. Interface with vehicle's on-board computer; perform diagnostic procedures using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action.
2. Identify causes of constant, intermittent, or no horn operation; determine needed action.
3. Inspect and test horn circuit relays, horns, switches, connectors, wires, and control components/modules; repair or replace as needed.
4. Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.
5. Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires and control components/modules; repair or replace as needed.
6. Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.
7. Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
8. Inspect and test side view mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires and control components/modules; repair or replace as needed.
9. Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.
10. Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.
11. Identify causes of slow, intermittent, or no power side window operation; determine needed action.
12. Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power side window circuits; repair or replace as needed.
13. Inspect and test block heaters; determine needed repairs.
14. Inspect and test cruise control electrical components; repair or replace as needed.
15. Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits.
16. Check operation of keyless and remote lock/unlock devices; determine needed action.
17. Inspect and test engine cooling fan electrical control components/modules; repair or replace as needed.
18. Identify causes of data bus communication problems; determine needed action.



## BRAKES

Content Area	Questions In Test
A. Air Brakes	22
B. Hydraulic Brakes	9
C. Air and Hydraulic Antilock Brake Systems (ABS) and Automatic Traction Control (ATC)	6
D. Wheel Bearings	3
Required To Pass: 20 of 40	40

Notes:

This test may include additional questions for statistical evaluation. Extra questions will not count for or against the final score. Since the extra questions are not identified, test candidates should answer every question to the best of their ability.

### A. Air Brakes

#### 1. Air Supply and Service Systems

1. Identify poor stopping, air leaks, premature wear, pulling, grabbing, dragging, or balance problems caused by supply and service system malfunctions; determine needed action.
2. Check air system build-up time; determine needed action.
3. Drain air reservoir/tanks; check for oil, water, and foreign material; determine needed action.
4. Inspect compressor drive gear and coupling; replace as needed.
5. Inspect air compressor inlet; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed.
6. Inspect and test air system pressure controls: governor, unloader assembly valves, filters, lines, hoses, and fittings; adjust or replace as needed.
7. Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed.
8. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, manual and automatic drain valves; replace as needed.
9. Inspect and clean air drier systems, filters, valves, heaters, wiring, and connectors; repair or replace as needed.
10. Inspect and test brake application (foot) valve, fittings, and mounts; check pedal operation; replace as needed.
11. Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed.
12. Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed.
13. Inspect and test brake relay valves; replace as needed.
14. Inspect and test quick release valves; replace as needed.
15. Inspect and test tractor protection valve; replace as needed.
16. Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed.
17. Inspect and test low pressure warning devices, wiring, and connectors; repair or replace as needed.
18. Inspect and test air pressure gauges, lines, and fittings; replace as needed.

#### 2. Mechanical/Foundation

1. Identify poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed action.
2. Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed.
3. Inspect and service slack adjusters; perform needed action.
4. Inspect camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; replace as needed.

5. Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs.
6. Inspect and measure brake shoes or pads; perform needed action.
7. Inspect and measure brake drums or rotors; perform needed action.

### **3. Parking Brakes**

1. Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations.
2. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed.
3. Inspect and test parking (spring) brake application and release valve; replace as needed.
4. Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturers' recommendations.

## **B. Hydraulic Brakes**

### **1. Hydraulic System**

1. Identify poor stopping, premature wear, pulling, dragging, balance, or pedal feel problems caused by the hydraulic system; determine needed action.
2. Check brake pedal pushrod length; adjust as needed.
3. Inspect and test master cylinder for internal/external leaks and damage; replace as needed.
4. Inspect hydraulic system brake lines, flexible hoses, and fittings for leaks and damage; replace as needed.
5. Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed.
6. Inspect and test brake pressure differential valve and warning light circuit switch, bulbs, wiring, and connectors; repair or replace as needed.
7. Inspect disc brake caliper assemblies; replace as needed.
8. Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type.

### **2. Mechanical/Foundation**

1. Identify poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems caused by mechanical components; determine needed action.
2. Inspect and measure rotors; perform needed action.
3. Inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
4. Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed.

### **3. Power Assist Units**

1. Identify stopping problems caused by the brake assist (booster) system; determine needed action.
2. Inspect, test, repair, or replace hydraulic brake assist (booster), hoses, and control valves; determine proper fluid type.
3. Check emergency (back-up, reserve) brake assist system.

## **C. Air and Hydraulic Antilock Brake Systems (ABS) and Automatic Traction Control (ATC)**

1. Observe antilock brake system (ABS) warning light operation (includes dash mounted trailer ABS warning light); determine needed action.
2. Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.
3. Identify poor stopping and wheel lock-up problems caused by failure of the antilock brake system (ABS); determine needed action.
4. Test and check operation of antilock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action.
5. Test antilock brake system (ABS) wheel speed sensors and circuits; adjust or replace as needed.
6. Bleed the ABS hydraulic circuits following manufacturers' procedures.
7. Observe automatic traction control (ATC) warning light operation; determine needed action.

8. Diagnose automatic traction control (ATC) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action.

**D. Wheel Bearings**

1. Clean, inspect, lubricate and replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings.
2. Inspect or replace extended service wheel bearing assemblies.

## SUSPENSION AND STEERING

Content Area	Questions In Test
A. Steering Systems	10
B. Suspension Systems	10
C. Wheel Alignment Diagnosis, Adjustment, and Repair	12
D. Wheels and Tires	5
E. Frame and Coupling Devices	3
Required To Pass: 20 of 40	TOTAL 40

### Notes:

This test may include additional questions for statistical evaluation. Extra questions will not count for or against the final score. Since the extra questions are not identified, test candidates should answer every question to the best of their ability.

### A. Steering Systems

#### 1. Steering Column

1. Identify causes of fixed and driver adjustable steering column and shaft noise, looseness, and binding problems; determine needed action.
2. Inspect and service steering shaft U-joint(s), slip joints, bearings, bushings, and seals; phase shaft..
3. Check and adjust cab mounting and ride height.
4. Center the steering wheel as needed.
5. Disable and enable supplemental restraint system (SRS) in accordance with manufacturers' procedures.

#### 2. Steering Units

1. Identify causes of power steering system noise, steering binding, darting/oversteer, reduced wheel cut, steering wheel kick, pulling, non-recovery, turning effort, looseness, hard steering, overheating, fluid leakage, and fluid aeration problems; determine needed action.
2. Determine recommended type of power steering fluid; check level and condition; determine needed action.
3. Flush and refill power steering system; purge air from system.
4. Perform power steering system pressure, temperature, and flow tests; determine needed action.
5. Inspect, service, or replace power steering reservoir including filter, seals, and gaskets.
6. Inspect power steering pump drive gear and coupling; replace as needed.
7. Inspect, adjust, or replace power steering pump, mountings, and brackets.
8. Inspect and replace power steering system cooler, lines, hoses, clamps/mountings, hose routings, and fittings.
9. Inspect, adjust, repair, or replace integral type power steering gear(s) (single and/or dual) and mountings.

#### 3. Steering Linkage

1. Inspect and align pitman arm; replace as needed.
2. Check and adjust steering (wheel) stops.
3. Inspect and lubricate steering arms and linkages.

### B. Suspension Systems

1. Inspect front axles and attaching hardware; determine needed action.
2. Inspect and service kingpin, steering knuckle bushings, locks, bearings, seals, and covers; determine needed action.
3. Inspect shock absorbers, bushings, brackets, and mounts; replace as needed.
4. Inspect leaf springs, center bolts, clips, pins and bushings, shackles, slippers, insulators, brackets, and mounts; determine needed action.

5. Inspect axle aligning devices such as radius rods, track bars, stabilizer bars, torque arms, related bushings, mounts, shims, and cams; determine needed action.
6. Inspect tandem suspension equalizer components; determine needed action.
7. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; adjust, repair or replace as needed.
8. Inspect air springs, mounting plates, springs, suspension arms, and bushings; replace as needed.
9. Measure ride height; determine needed action.
10. Identify rough ride problems; determine needed action.

**C. Wheel Alignment Diagnosis, Adjustment, and Repair**

1. Identify causes of vehicle wandering, pulling, shimmy, hard steering, and off-center steering wheel problems; adjust or repair as needed.
2. Check camber; determine needed action.
3. Check caster; adjust as needed.
4. Check toe; adjust as needed.
5. Check rear axle(s) alignment (thrustline/centerline) and tracking; adjust or repair as needed.
6. Identify turning/Ackerman angle (toe-out-on-turns) problems; determine needed action.
7. Check front axle alignment (centerline); adjust or repair as needed.

**D. Wheels and Tires**

1. Identify tire wear patterns, check tread depth and pressure determine needed action.
2. Identify wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action.
3. Remove and install steering and drive axle wheel/tire assemblies.
4. Inspect tire for proper application, (size, load range, position, and tread design); determine needed action.
5. Inspect wheel/rims for proper application, load range, size, and design; determine needed action.
6. Check operation of tire pressure monitoring system; determine needed action.

**E. Frame and Coupling Devices**

1. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, and mounting hardware.
2. Inspect and service sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls.
3. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs.
4. Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures.
5. Inspect, repair, or replace pintle hooks and draw bars.

## INSPECTION, MAINTENANCE, AND MINOR REPAIR

Content Area	Questions In Test
A. Diesel Engines	10
B. Drive Train	8
C. Brakes	12
D. Suspension and Steering	8
E. Electrical/Electronic Systems	11
F. Heating, Ventilation, and Air Conditioning	6
G. Cab	5
Required to Pass: 36 of 60	60

Notes:

This test may include additional questions for statistical evaluation. Extra questions will not count for or against the final score. Since the extra questions are not identified, test candidates should answer every question to the best of their ability.

### A. DIESEL ENGINES (DE)

#### DE-A. General

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
2. Inspect level and condition of fuel, oil, diesel exhaust fluid (DEF), and coolant.
3. Inspect engine assembly for fuel, oil, coolant, air, and other leaks.
4. Check engine operation (starting and running) including: noise, vibration, smoke, etc.
5. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.
6. Identify system components, configurations, and types of the following: cylinder head(s), valve train, engine block, engine lubrication, engine cooling, air induction, exhaust, fuel, and engine braking.

#### DE-B. Cylinder Head and Valve Train

1. Inspect electronic wiring harness and brackets for wear, bending, cracks, and looseness.

#### DE-C. Engine Block

1. Inspect crankshaft vibration damper; inspect engine mounts.

#### DE-D. Lubrication Systems

1. Test engine oil pressure and check operation of pressure sensor, gauge, and/or sending unit; test engine oil temperature and check operation of temperature sensor.
2. Check engine oil level, condition, and consumption; take engine oil sample.
3. Determine proper lubricant; perform oil and filter service.

#### DE-E. Cooling System

1. Check engine coolant type, level, condition, and test coolant for freeze protection and additive package concentration.
2. Verify coolant temperature; check operation of temperature and level sensors, gauge, and/or sending unit.
3. Inspect and reinstall/replace pulleys, tensioners and drive belts; adjust drive belts and check alignment.
4. Recover coolant, flush, and refill with recommended coolant/additive package; bleed cooling system.
5. Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed.

6. Inspect water pump, hoses, and clamps.
7. Inspect, and pressure test cooling system(s); pressure test cap, tank(s), and recovery systems; inspect radiator and mountings.
8. Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud.
9. Identify engine block heater(s).

**DE-F. Air Induction and Exhaust Systems**

1. Inspect turbocharger(s), wastegate(s), and piping systems.
2. Check air induction system including: cooler assembly, piping, hoses, clamps, and mountings; replace air filter as needed; reset restriction indicator (if applicable).
3. Inspect intake manifold, gaskets, and connections.
4. Inspect engine exhaust system, exhaust gas recirculation (EGR) system, and exhaust aftertreatment system for leaks, mounting, proper routing, and damaged or missing components.
5. Inspect crankcase ventilation system; service as needed.

**DE-G. Fuel System**

1. Check fuel level and condition.
2. Inspect fuel tanks, vents, caps, mounts, valves, screens, crossover system, hoses, lines, and fittings.
3. Inspect low pressure fuel system components (fuel pump, pump drives, screens, fuel/water separators/indicators, hoses, lines, filters, heaters, coolers, ECM cooling plates, check valves, pressure regulator valves, restrictive fittings, and mounting hardware).
4. Replace fuel filter; prime and bleed fuel system.
5. Inspect high pressure fuel system components (fuel pump, pump drives, hoses, injection lines, filters, hold-downs, fittings, seals, and mounting hardware).

**DE-H. Engine Brakes**

1. Inspect engine compression and/or exhaust brake housing, valves, seals, lines, and fittings.

**B. DRIVE TRAIN (DT)**

**DT-A. General**

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
2. Identify drive train components, transmission type, and configuration.

**DT-B. Clutch**

1. Inspect and adjust clutch, clutch brake, linkage, cables, levers, brackets, bushings, pivots, springs, and clutch safety switch (includes push-type and pull-type); check pedal height and travel; determine needed action.
2. Inspect clutch master cylinder fluid level; check clutch master cylinder, slave cylinder, lines, and hoses for leaks and damage; determine needed action.

**DT-C. Transmission**

1. Inspect transmission shifter and linkage; inspect transmission mounts, insulators, and mounting bolts.
2. Inspect transmission for leakage; determine needed action.
3. Replace transmission cover plates, gaskets, seals, and cap bolts; inspect seal surfaces and vents; determine needed action.
4. Check transmission fluid level and condition; determine needed action.
5. Inspect transmission breather; inspect transmission oil filters, coolers and related components; determine needed action.
6. Inspect speedometer components.
7. Inspect and test function of REVERSE light, neutral start, and warning device circuits.

**DT-D. Driveshaft and Universal Joints**

1. Inspect, service, and/or replace driveshafts, slip joints, yokes, drive flanges, support bearings, universal joints, boots, seals, and retaining/mounting hardware; check phasing of all shafts.

#### **DT-E. Drive Axles**

1. Check for fluid leaks; inspect drive axle housing assembly, cover plates, gaskets, seals, vent/breather, and magnetic plugs.
2. Check drive axle fluid level and condition; check drive axle filter; determine needed action.
3. Inspect air-operated power divider (inter-axle differential) assembly including: diaphragms, seals, springs, yokes, pins, lines, hoses, fittings, and controls.
4. Inspect drive axle shafts; determine needed action.
5. Remove and replace wheel assembly; check rear wheel seal and axle flange for leaks; determine needed action.

#### **C. BRAKES (TB)**

##### **TB-A. General**

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
2. Identify brake system components and configurations (including air and hydraulic systems, parking brake, power assist, and vehicle dynamic brake systems).
3. Identify brake performance problems caused by the mechanical/foundation brake system (air and hydraulic).

##### **TB-B. Air Brakes: Air Supply and Service Systems**

1. Inspect air supply system components such as compressor, governor, air drier, tanks, and lines; inspect service system components such as lines, fittings, mountings, and valves (hand brake/trailer control, brake relay, quick release, tractor protection, emergency/spring brake control/modulator, pressure relief/safety).
2. Verify proper gauge operation and readings; verify low pressure warning alarm operation; perform air supply system tests such as pressure build-up, governor settings, and leakage; drain air tanks and check for contamination.

##### **TB-C. Air Brakes: Mechanical/Foundation Brake System**

1. Inspect service brake chambers, diaphragms, clamps, springs, pushrods, clevises, and mounting brackets; determine needed action.
2. Identify slack adjuster type; inspect slack adjusters; determine needed action.
3. Check camshafts (S-cams), tubes, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins, and springs; determine needed action.
4. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.
5. Inspect, clean, and adjust air disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; perform needed action.
6. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; determine needed action.

##### **TB-D. Air brakes: Parking Brake System**

1. Inspect and check parking (spring) brake chamber for leaks; determine needed action.
2. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; determine needed action.
3. Inspect and test parking (spring) brake application and release valve; determine needed action.
4. Manually release (cage) and reset (uncage) parking (spring) brakes.

##### **TB-E. Hydraulic Brakes: Hydraulic System**

1. Check master cylinder fluid level and condition; determine proper fluid type for application.
2. Inspect hydraulic brake system components for leaks and damage.
3. Check hydraulic brake system operation including pedal travel, pedal effort, and pedal feel.



**TB-F. Hydraulic Brakes: Mechanical/Foundation Brake System**

1. Inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action.
2. Inspect and clean disc brake caliper assemblies; inspect and measure disc brake pads; inspect mounting hardware; determine needed action.
3. Remove brake drum; clean and inspect brake drum and mounting surface; measure brake drum diameter; measure brake lining thickness; inspect brake lining condition; inspect wheel cylinders; determine needed action.

**TB-G. Hydraulic Brakes: Parking Brake System**

1. Check parking brake operation; inspect parking brake application and holding devices.

**TB-H. Power Assist Systems**

1. Check brake assist/booster system (vacuum or hydraulic) hoses and control valves; check fluid level and condition (if applicable).
2. Check operation of emergency (back-up/reserve) brake assist system.

**TB-I. Vehicle Dynamic Brake Systems (Air and Hydraulic): Antilock Brake System (ABS), Automatic Traction Control (ATC) System, and Electronic Stability Control (ESC) System**

1. Observe antilock brake system (ABS) warning light operation including trailer and dash mounted trailer ABS warning light.
2. Observe automatic traction control (ATC) and electronic stability control (ESC) warning light operation.

**TB-J. Wheel Bearings**

1. Clean, inspect, lubricate, and/or replace wheel bearings and races/cups; replace seals and wear rings; inspect spindle/tube; inspect and replace retaining hardware; adjust wheel bearings; check hub assembly fluid level and condition; verify end play with dial indicator method.
2. Identify, inspect, and/or replace unitized/preset hub bearing assemblies.

**D. SUSPENSION AND STEERING****TS-A. General**

1. Research vehicle service information, including fluid type, vehicle service history, service precautions, and technical service bulletins.
2. Disable and enable supplemental restraint system (SRS); verify indicator lamp operation.
3. Identify suspension and steering system components and configurations.

**TS-B. Steering Column**

1. Check steering wheel for free play, binding, and proper centering; inspect and service steering shaft U-joint(s), slip joint(s), bearings, bushings, and seals; phase steering shaft.
2. Check operation of tilt and telescoping steering column.
3. Check cab mounting.

**TS-C. Steering Pump and Gear Units**

1. Check power steering pump and gear operation, mountings, lines, and hoses; check fluid level and condition; service filter; inspect system for leaks.
2. Flush and refill power steering system; purge air from system.

**TS-D. Steering Linkage**

1. Inspect tie rod ends, ball joints, kingpins, pitman arms, idler arms, and other steering linkage components; lubricate as needed.

**TS-E. Suspension Systems**

1. Inspect shock absorbers, bushings, brackets, and mounts; determine needed action.
2. Inspect leaf springs, center bolts, clips, pins, bushings, shackles, U-bolts, insulators, brackets, and mounts; determine needed action.
3. Inspect axle and axle aligning devices such as: radius rods, track bars, stabilizer bars, and torque arms; inspect related bushings, mounts, and shims.

4. Inspect tandem suspension equalizer components.
5. Inspect and test air suspension pressure regulator and height control valves, lines, hoses, dump valves, and fittings; check and record ride height.
6. Inspect air springs, mounting plates, springs, suspension arms, and bushings.

#### **TS-F. Wheel Alignment**

1. Demonstrate understanding of alignment angles.

#### **TS-G. Wheels and Tires**

1. Inspect tire condition; identify tire wear patterns; measure tread depth; verify tire matching (diameter and tread); inspect valve stem and cap; set tire pressure.
2. Identify wheel/tire vibration, shimmy, pounding, and hop (tramp) problems.
3. Check wheel mounting hardware; check wheel condition; remove and install wheel/tire assemblies (steering and drive axle); torque fasteners to manufacturer's specification using torque wrench.

#### **TS-H. Frame and Coupling Devices**

1. Inspect, service, and/or adjust fifth wheel, pivot pins, bushings, locking mechanisms, mounting hardware, air lines, and fittings.
2. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage.
3. Inspect frame hangers, brackets, and cross members.
4. Check pintle hook and mounting (if applicable).

### **E. ELECTRICAL/ELECTRONIC SYSTEMS (TE)**

#### **TE-A. General**

1. Research vehicle service information, including vehicle service history, service precautions, and technical service bulletins.
2. Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
3. Demonstrate proper use of test equipment when measuring source voltage, voltage drop (including grounds), current flow, continuity, and resistance.
4. Demonstrate knowledge of the causes and effects of shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
5. Use wiring diagrams to trace electrical/electronic circuits.
6. Measure parasitic (key-off) battery drain.
7. Demonstrate knowledge of the function, operation, and testing of fusible links, circuit breakers, relays, solenoids, diodes, and fuses.
8. Inspect, repair (including solder repair), and/or replace connectors, seals, terminal ends, and wiring; verify proper routing and securement.
9. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.
10. Check for malfunctions caused by faults in the data bus communications network.
11. Identify electrical/electronic system components and configuration.

#### **TE-B. Battery System**

1. Identify battery type and system configuration.
2. Confirm proper battery capacity for application; perform battery state-of-charge test; perform battery capacity test, determine needed action.
3. Inspect battery, battery cables, connectors, battery boxes, mounts, and hold-downs; determine needed action.
4. Charge battery using appropriate method for battery type.
5. Jump-start vehicle using a booster battery and jumper cables or using an appropriate auxiliary power supply.

6. Identify low voltage disconnect (LVD) systems.

#### **TE-C. Starting System**

1. Demonstrate understanding of starter system operation.
2. Perform starter circuit cranking voltage and voltage drop tests.
3. Inspect starter control circuit switches, relays, connectors, terminals, wires, and harnesses (including over-crank protection).

#### **TE-D. Charging System**

1. Identify and understand operation of the generator (alternator).
2. Check instrument panel mounted voltmeters and/or indicator lamps.
3. Inspect generator (alternator) drive belt condition; check pulleys and tensioners for wear; check fans and mounting brackets; verify proper belt alignment.
4. Inspect cables, wires, and connectors in the charging circuit.
5. Perform charging system voltage and amperage output tests; perform AC ripple test.

#### **TE-E. Lighting Systems**

1. Inspect for brighter-than-normal, intermittent, dim, or no-light operation; determine needed action.
2. Test, replace, and aim headlights.
3. Inspect cables, wires, and connectors in the lighting systems.
4. Inspect tractor-to-trailer multi-wire connectors, cables, and holders.

#### **TE-F. Instrument Cluster and Driver Information Systems**

1. Check gauge and warning indicator operation.
2. Identify the sensor/sending units, gauges, switches, relays, bulbs/LEDs, wires, terminals, connectors, sockets, printed circuits, and control components/modules of the instrument cluster, driver information system, and warning systems.

### **F. HEATING, VENTILATION, AND AIR CONDITIONING (CC)**

#### **CC-A. General**

1. Research vehicle service information, including refrigerant/oil type, vehicle service history, service precautions, and technical service bulletins.
2. Identify heating, ventilation, and air conditioning (HVAC) components and configuration.
3. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; interpret digital multimeter (DMM) readings.

#### **CC-B. Refrigeration System Components**

1. Inspect A/C compressor drive belts, pulleys, and tensioners; verify proper belt alignment.
2. Check A/C system operation including system pressures; visually inspect A/C components for signs of leaks; check A/C monitoring system (if applicable).
3. Inspect A/C condenser for airflow restrictions; determine needed action.

#### **CC-C. Heating, Ventilation, and Engine Cooling Systems**

1. Inspect engine cooling system and heater system hoses and pipes; determine needed action.
2. Inspect HVAC system-heater ducts, doors, hoses, cabin filters, and outlets; determine needed action.
3. Identify the source of A/C system odors.

#### **CC-D. Operating Systems and Related Controls**

1. Verify blower motor operation; confirm proper air distribution; confirm proper temperature control; determine needed action.

### **G. CAB (TC)**

#### **TC-A. General**

1. Research vehicle service information including, vehicle service history, service precautions, and technical service bulletins.

2. Use appropriate electronic service tool(s) and procedures to diagnose problems; check, record, and clear diagnostic codes; check and record trip/operational data; reset maintenance monitor (if applicable); interpret digital multimeter (DMM) readings.

**TC-B. Instruments and Controls**

1. Inspect mechanical key condition; check operation of ignition switch; check operation of indicator lights, warning lights and/or alarms; check instruments; record oil pressure and system voltage; check operation of electronic power take-off (PTO) and engine idle speed controls (if applicable).
2. Check operation of all accessories.
3. Understand operation of auxiliary power unit (APU)/electric power unit (EPU).

**TC-C. Safety Equipment**

1. Check operation of horns (electric and air); check warning device operation (reverse, air pressure, etc.); check condition of spare fuses, safety triangles, fire extinguisher, and all required decals; inspect seat belts and sleeper restraints; inspect condition of wiper blades and arms.

**TC-D. Hardware**

1. Check operation of wipers and washer; inspect windshield glass for cracks or discoloration; check sun visor; check seat condition, operation, and mounting; check door glass and window operation; verify operation of door and cab locks; inspect steps and grab handles; inspect mirrors, mountings, brackets, and glass.
2. Record all physical damage.
3. Lubricate all cab grease fittings; inspect and lubricate door and hood hinges, latches, strikers, lock cylinders, safety latches, linkages, and cables.
4. Inspect cab mountings, hinges, latches, linkages, and ride height.
5. Inspect quarter fender, mud flaps, and brackets.