

Heavy Equipment Technician Off-Road Practice Interprovincial Red Seal Exam

Disclaimer: This is NOT an Interprovincial Standards (Red Seal) Examination. This is a practice examination that has been developed using similar weighting, question distribution, question taxonomies and question styles to that of a red seal examination. Success on this examination will NOT result in certification or qualification. This examination is intended to be used for self assessment in preparation for attempting a red seal examination. More information about the standard that the red seal examination is based on may be found within the National Occupational Analysis for the occupation at www.red-seal.ca.

Section 1

OCCUPATIONAL SKILLS

1. Who is responsible for the safe operation of lifting equipment?
 - A. Occupational Health & Safety.
 - B. The equipment manufacturer.
 - C. Workers' Compensation Board.
 - D. The technician using the equipment.

2. What should a technician do before using a shop boom lift?
 - A. Match lifting capacity of the boom and legs.
 - B. Extend boom to maximum reach.
 - C. Extend one leg to maintain boom level.
 - D. Retract legs for extended clearance.

3. What is the appropriate personal protective equipment when using a wire wheel?
 - A. Safety glasses.
 - B. Full-face shield.
 - C. Leather apron.
 - D. Nitrile gloves.

4. Why should DOT 4 brake fluid be kept in a sealed container?
 - A. It will evaporate.
 - B. It will absorb moisture.
 - C. It will absorb air.
 - D. It is flammable.

5. What type of flare is used on hydraulic brake systems?
 - A. JIC
 - B. Single.
 - C. Double.
 - D. Compression.

6. What is the proper procedure for heating a bearing prior to installation?
 - A. Use an open flame.
 - B. Suspend in hot water.
 - C. Lay directly on a heating element.
 - D. Heat cabinet or oven.

7. Why is it important to maintain proper service records?
 - A. Determine current condition of engine.
 - B. Reduce equipment downtime.
 - C. Track service and repair history.
 - D. Schedule equipment downtime.

8. What is the purpose of the pre-service walk-around inspection?
 - A. Visually verify condition of equipment.
 - B. Perform equipment shutdown procedures.
 - C. Record and report findings from operational checkout.
 - D. To allow equipment to reach temperature before use.

9. Which procedure would be most effective when diagnosing an equipment malfunction?
- A. Access previous parts requisitions.
 - B. Repair existing faults, then talk to operator.
 - C. Talk to the operator and access machine repair history.
 - D. Discuss with another technician, and the service writer.
10. What is the proper procedure for cleaning up an oil spill?
- A. Wash floor and squeegee down drain.
 - B. Soak up with rags and dispose in garbage can.
 - C. Contain the spill and dispose of waste properly.
 - D. Flush down the drain and call waste disposal company.
11. What is the maximum temperature a sealed bearing can be heated?
- A. 60°C (140°F)
 - B. 80°C (180°F)
 - C. 100°C (212°F)
 - D. 120°C (250°F)
12. What safety measures should be taken before welding?
- A. Wear a static strap to avoid unwanted arcing.
 - B. Place ground clamp as far as possible from weld.
 - C. Cool area to be welded to ensure good penetration.
 - D. Place ground clamp as close to weld as possible.

Section 2

ENGINES AND ENGINE SUPPORT SYSTEMS

13. Which of the following conditions will cause a bent connecting rod?
- A. A hydrostatic lock.
 - B. Leaking liner O-rings.
 - C. Piston to valve contact.
 - D. Excessive bearing clearance.
14. What is the cause of white exhaust smoke on an engine at operating temperature?
- A. Worn valve guides.
 - B. Leaking injector tubes.
 - C. Leaking turbocharger seals.
 - D. Cracked air-to-air charge cooler.
15. What will cause blue exhaust smoke?
- A. Leaking injector nozzle.
 - B. Leaking injector cup.
 - C. Excessive valve lash.
 - D. Worn valve guides.
16. What will cause a sudden drop in oil pressure?
- A. Worn oil pump.
 - B. Worn main bearings.
 - C. Regulating valve stuck open.
 - D. Regulating valve stuck closed.

17. What is the cause of excessive engine oil temperature?
- A. Low oil level.
 - B. Low oil pressure.
 - C. Oil cooler bypass valve stuck closed.
 - D. Bent piston cooling nozzles.
18. What would cause an engine to operate at an excessively high temperature?
- A. Seized fan clutch.
 - B. Thermostat stuck open.
 - C. Slipping water pump belt.
 - D. Plugged coolant bypass hose.
19. What will cause engine overheating if the top rad hose is cold and the bottom rad hose is hot?
- A. Thermostat stuck open.
 - B. A blocked bypass circuit.
 - C. Thermostat is stuck closed.
 - D. Radiator core is leaking.
20. What will cause seized turbocharger bearings?
- A. Plugged drain line.
 - B. Restricted air intake.
 - C. Insufficient cool down time.
 - D. Excessive engine oil pressure.
21. What will cause high fuel inlet restriction?
- A. Worn transfer pump.
 - B. Plugged fuel tank vent.
 - C. Restricted fuel return line.
 - D. Plugged secondary fuel filter.

22. Which of the following conditions will cause rough running and low engine power output?
- A. Air in the fuel system.
 - B. Fuel heater open circuit.
 - C. Plugged primary fuel filter.
 - D. Misadjusted fuel shutoff solenoid.
23. On a HEUI fuel system, which of the following will cause a hard or no start condition?
- A. High engine oil pressure.
 - B. High engine oil level.
 - C. Leaking injector oil return.
 - D. Slow cranking speed.
24. What will cause an electronically controlled engine to start and run but **not** accelerate?
- A. Speed / timing signal open circuit.
 - B. Oil pressure sensor short circuit.
 - C. Throttle position sensor open circuit.
 - D. Coolant temperature sensor short circuit.
25. What will cause the rail pressure limiting valve to open on a “Common Rail” fuel system?
- A. A plugged accumulator.
 - B. A faulty rail pressure control valve.
 - C. A plugged injector line.
 - D. A faulty injection nozzle.
26. What will a plugged diesel particulate filter (DPF) cause?
- A. EGR valve failure.
 - B. Excessive tailpipe temperatures.
 - C. DPF inlet temperature sensor failure.
 - D. Excessive exhaust system backpressure.

27. What must be done when installing piston rings?
- A. Line up the ring gaps.
 - B. Stagger the ring gaps.
 - C. Measure the ring grooves.
 - D. Position the ring gaps in line with the pin bores.
28. What should be done when using plastigage to measure main bearing clearance?
- A. Lubricate journal, install plastigage, rotate crankshaft, read clearance.
 - B. Install plastigage, lubricate journal, torque bearing cap, read clearance.
 - C. Install bearing cap, torque bearing cap, rotate crankshaft, remove plastigage.
 - D. Install plastigage, torque bearing cap, remove bearing cap, read clearance.
29. What is done when testing engine oil pressure?
- A. Install a gauge and run the engine at high idle to open the relief valve.
 - B. Install a gauge upstream of the oil filter and run the engine at idle speed.
 - C. Install a gauge in the oil filter and run the engine at a specific RPM.
 - D. Install a gauge in the main oil gallery and run the engine at a specific RPM.
30. What procedure must be followed when the coolant has been contaminated with engine oil?
- A. Replace liner O-rings, water pump and antifreeze.
 - B. Flush system thoroughly and replace antifreeze.
 - C. Replace engine seals, hoses and recharge antifreeze with SCA.
 - D. Pressure test for leakage, check antifreeze and SCA concentration.
31. When installing a new or rebuilt turbocharger what is done?
- A. Inspect exhaust system and purge air from the oil supply line.
 - B. Inspect air filter and pre-lubricate turbo with clean engine oil.
 - C. Restrict the air inlet to prevent the turbo from motoring without oil.
 - D. Restrict the return line while cranking the engine to fill the turbo cavity.

32. What should be done after performing fuel filter service?
- A. Bleed the fuel system.
 - B. Purge the fuel system.
 - C. Test fuel inlet restriction.
 - D. Flush contamination from the fuel lines.
33. What steps must be followed to repair an active fault code?
- A. Use a scan tool to locate and replace the faulty component.
 - B. Test system for proper operation, locate and repair the fault.
 - C. Locate and repair the fault, test system for proper operation.
 - D. Erase the code with a scan tool and run engine to verify problem.
34. What is the correct procedure when performing circuit checks on computer controlled engine?
- A. Disconnect the battery and use an analogue multi-meter.
 - B. Test voltage and resistance with a high impedance test light.
 - C. Test voltage and resistance using a high input impedance digital meter.
 - D. Disconnect the wiring harness and use a low input impedance digital meter.
35. What is an important step when preparing a DPF for cleaning?
- A. Test dosing unit operation.
 - B. Perform a passive regeneration.
 - C. Flush the core with high pressure water.
 - D. Mark the direction of flow through the core.
36. Which procedure will prevent the SCR system from freezing up at low ambient temperatures?
- A. Insulate the DEF (Urea) reservoir.
 - B. Increase the ammonia strength of the DEF solution.
 - C. Install a heating blanket on the DEF (Urea) reservoir.
 - D. Repair the temperature sensing circuit in the DEF (Urea) reservoir.

Section 3

HYDRAULIC, HYDROSTATIC AND PNEUMATIC SYSTEMS

37. A hydraulic cylinder has reduced lifting capacity, but the cycle times and pressures are within specs. Which procedure should be performed next?
- A. Replace the pump.
 - B. Cylinder leakage test.
 - C. Check the directional control valve for a sticky spool.
 - D. Check the pressures for the pilot control valve.
38. What would cause low flow under all test pressures when testing for pump efficiency?
- A. High oil temperatures.
 - B. Excessive reservoir pressure.
 - C. Pump inlet restriction.
 - D. Pump speed is too high.
39. A disassembled pump shows gear track wear. What could have caused this damage?
- A. Over speed operation.
 - B. Small particle contamination.
 - C. Operation with low oil levels.
 - D. Operation at excessively high pressures.
40. When flow testing a gear pump, it produces 250 lpm (55 gpm) at low pressure, but the pump flow drops to 150 lpm (33 gpm) at normal working pressure. What is recommended?
- A. Replace the pump.
 - B. Normal pump efficiency.
 - C. Test main relief valve pressures.
 - D. Test circuit relief valve pressure.

41. All the hydraulic circuits are functioning normally except for the boom circuit. What is the cause?
- A. Worn hydraulic pump.
 - B. Pump load sensing line failure.
 - C. Restricted inlet filter.
 - D. Failed joystick switch.
42. What operating condition would cause a gear pump housing to crack or the pump shaft to twist off?
- A. Over speed operation.
 - B. Operation with a high pump inlet restriction.
 - C. Over pressure operation.
 - D. Excessive periods of very low speed operation.
43. What will happen to an inline axial piston pump if the housing drain port is blocked while the pump is operating at high pressure?
- A. The shaft seal will fail and start leaking.
 - B. The inlet pressure will drop and cause the pump to cavitate.
 - C. The force between the shoe and swashplate will increase.
 - D. Leakage into the housing will decrease as housing pressure increases.
44. How will the performance of a reversible gear motor be affected if one of the motor check valves leaks?
- A. Motor shaft seal will fail and start leaking.
 - B. The motor will have reduced torque and speed in one direction.
 - C. The motor will run slower than normal in both directions.
 - D. The motor torque output will be reduced in both directions.
45. An inlet check valve of a closed loop hydrostatic drive system is stuck open. How will this affect system operation?
- A. Normal torque but reduced speed in both directions.
 - B. Normal speed and normal torque in both directions.
 - C. Reduced speed and torque in both directions.
 - D. Reduced speed and torque in one direction and normal in the other.

46. What would cause the hydrostatic system to completely stop operating?
- A. High pressure relief valve stuck open.
 - B. Charge pump failure.
 - C. Motor flushing valve stuck closed.
 - D. Cooler bypass valve stuck open.
47. What condition would cause complete failure of the hydrostatic axial piston drive motor?
- A. Low oil levels in the reservoir.
 - B. Restricted inlet line or filters.
 - C. Runaway load over speeding the motor.
 - D. Overloading the motor.
48. A hydrostatic system main pump fails shortly after installation. What caused this failure?
- A. Externally plugged oil cooler.
 - B. Excessive charge pump pressure.
 - C. High pressure relief set too low.
 - D. Contamination.
49. What is wrong with a hydrostatic drive system that will operate in reverse but **not** in forward?
- A. Servo pistons are scored.
 - B. Drive motor overloaded.
 - C. Low charge pump pressure.
 - D. Pressure relief valve stuck open.
50. What will cause an air compressor to cycle excessively?
- A. Air tank is too large.
 - B. Compressor has internal wear.
 - C. Air tank relief valve is leaking.
 - D. Compressor cutout pressure is set too low.

51. What is the problem with an air starter when the engine has a slow cranking speed?
- A. The starter has a restricted outlet or muffler.
 - B. The relay valve is stuck in a closed position.
 - C. A worn compressor with a slow recovery time.
 - D. The starter drive gear is not disengaging from the flywheel.
52. Which condition would result in a low output air delivery from a rotary air compressor?
- A. Low cutout pressure.
 - B. Excessive rotor to housing clearance.
 - C. Lubricating mechanism failure.
 - D. Incorrect rotor timing.
53. If the air brakes are working normally, but all the air system accessories such as air ride seat or the air starter are **not** functioning, what is the problem?
- A. Pressure protection valve has failed and will not open.
 - B. Air compressor governor unloader valve has failed.
 - C. One way check valve between compressor and tanks is leaking.
 - D. The air starter motor is leaking and draining the reservoir.
54. What step takes fluid viscosity into account during hydraulic system tests?
- A. Running the engine at the specified speed.
 - B. Checking the oil level and condition.
 - C. Starting the test with an open flow control in the flow meter.
 - D. Warming the hydraulic fluid to operating temperature.

55. What is the sequence for setting the maximum normal working pressure in a closed center system using a pressure compensated pump and a system relief valve?
- A. Raise relief valve setting above compensator, set compensator and reset relief valve.
 - B. Raise compensator above the relief valve setting, set relief valve and reset compensator.
 - C. Set relief valve pressure, set compensator pressure.
 - D. Set compensator pressure, set relief valve pressure.
56. What would be the first step in troubleshooting an electrohydraulic control system which uses an ECU to control hydraulic circuit operation?
- A. Test the ECU (electronic control unit) system voltage.
 - B. Change the hydraulic fluid and all hydraulic filters.
 - C. Check for diagnostic trouble codes.
 - D. Check and clean the wiring harness connectors at the valve solenoids.
57. What is the procedure for pressure testing an open center hydraulic system with a relief valve setting of 35 MPa (5 075 psi)?
- A. Install a 35 MPa (5 000 psi) gauge, run engine at high idle and roll the bucket back against its stop.
 - B. Install a 50 MPa (7 500 psi) gauge, run engine at low idle and stall an actuator.
 - C. Install a 75 MPa (10 000 psi) gauge, run engine at low idle and roll the bucket back against its stop.
 - D. Install a 100 MPa (15 000 psi) gauge, run engine at high idle and stall an actuator.

58. What procedure should be used to set the low standby pressure on a closed center system with a load sensing pump?
- A. Run the engine at specified speed, stall a cylinder and set the pump compensator valve.
 - B. Run the engine at specified speed, operate the pump at full flow and set the load sensing valve.
 - C. Run the engine at specified speed, leave the control valves in neutral and set the load sensing valve.
 - D. Run the engine at specified speed, operate the pump at full flow and set system relief valve.
59. A hydrostatic system creeps forward when the operator control is in neutral. How is the system adjusted to correct the problem?
- A. The motor swash plate stop screw is adjusted.
 - B. The flushing valve is adjusted to a centered position.
 - C. The control linkage is adjusted to a neutral position.
 - D. The high pressure relief valves are set to equal pressures.
60. A hydrostatic motor has failed. In addition to replacing the motor, what other procedures must be completed?
- A. Flush the system, flush the motor, change oil and change filters.
 - B. Replace high pressure relief valves, flush system and change oil.
 - C. Wash and service the cooler, flush the system, change oil and filters.
 - D. Flush the system, replace filters, change oil and replace or service pump.
61. A closed loop hydrostatic drive functions in one direction, but not the other. How is the system tested to identify the problem?
- A. Pressure gauges are installed in the two hydrostatic pump outlet lines and the pressures are tested as the motor is stalled in each direction.
 - B. A pressure gauge is installed in the charge pump outlet line and the pressures are tested at both low and high idle.
 - C. A pressure gauge is installed at the motor inlet and the pressures are tested as the motor is operated at both stalled and maximum speed.
 - D. Two pressure gauges are installed at the motor flushing valve and the pressures are tested when the motor is operated in both directions with a light load.

62. The air tank has excessive amounts of oil and water build-up. What are the service procedures?
- A. Replace the air dryer and turbocharger seals.
 - B. Repair the compressor and flush the air tanks.
 - C. Replace the air dryer and oil cooler.
 - D. Repair compressor and replace the air dryer.
63. What is the service procedure to test a compressor governor?
- A. Bleed down air and record cut-in pressure, then build-up air and record cut-out pressure.
 - B. Bleed down air and record cut-out pressure, then build-up air and record cut-in pressure.
 - C. Record the air build-up time until the compressor cuts out, then record pressure.
 - D. Run to maximum pressure, stop engine and record the pressure drop after 10 minutes.

Section 4

DRIVETRAIN SYSTEMS

64. The transmission shifts hard, the input bearing is noisy and the unit has had repeated clutch failures. What would be the cause of this problem?
- A. Seized pilot bearing.
 - B. Wrong clutch material.
 - C. Improper adjustment.
 - D. Clutch housing alignment.
65. What will cause an automatic transmission retarder to have poor braking performance and produce excessive heat?
- A. The torque convertor lock-up clutch is slipping.
 - B. The stator is freewheeling during stall conditions.
 - C. The retarder valve is stuck in the closed position.
 - D. The retarder valve is stuck in the open position.
66. Which of the following would cause the engine speed at converter stall to be higher than specification?
- A. The convertor fluid was aerated.
 - B. Engine power output is below specifications.
 - C. The stator was not held stationary during the stall.
 - D. The inlet strainer for the inverter charge pump was restricted.
67. What would cause vibration, a hard “clunk” over uneven ground, and the driveshaft to be out of phase?
- A. A seized u-joint.
 - B. The steady bearing support worn.
 - C. A driveline working angle of 4°.
 - D. Twisted driveshaft due to severe shock loads.

68. What would cause one u-joint to wear out repeatedly with signs of brinelling?
- A. Water contamination.
 - B. Bent or damaged yoke.
 - C. Insufficient driveline working angle.
 - D. A 1° difference in working angle.
69. What would cause a hydraulically controlled automatic transmission to shift from first to second too soon, while all the other shift points are normal?
- A. Governor pressure is too low.
 - B. Spring tension at the 1-2 shift signal valve is too low.
 - C. Spring tension at the 1-2 shift signal valve is too high.
 - D. Return spring tension in the second speed clutch is low.
70. How should throttle position changes affect shifting in a hydraulically controlled automatic transmission?
- A. Throttle position affects shift quality, not shift points.
 - B. Full or heavy throttle operation should cause the transmission to upshift at lower speed.
 - C. Full or heavy throttle operation should cause the transmission to downshift at higher speed.
 - D. Light or gentle throttle operation should cause the transmission to downshift at higher speed.
71. What would cause a high temperature reading on the the input pinion of a rear axle after overhaul?
- A. Excessive ring gear backlash.
 - B. Excessive pinion bearing preload.
 - C. Excessive carrier bearing preload .
 - D. Insufficient pinion bearing preload.

72. What would cause a heavy heel pattern on a hypoid gear set?
- A. Pinion is in too far.
 - B. Pinion is out too far.
 - C. Backlash is excessive.
 - D. Backlash is insufficient.
73. What would cause the right side tandem housing to tip in toward the top of the grader frame?
- A. Uneven tire inflation.
 - B. Low tire pressure.
 - C. Failed axle bearings.
 - D. Worn pivot bushings .
74. Which procedure should be performed when replacing a clutch?
- A. Install the transmission, then check bore alignment .
 - B. Measure flywheel housing depth, then face alignment.
 - C. Install the pressure plate, then check friction disc alignment.
 - D. Check bell housing alignment before installing clutch assembly.
75. During a convertor/transmission repair, how is a torque convertor checked for leakage?
- A. Dye and an ultraviolet light.
 - B. A hydrostatic pressure test.
 - C. Fill the converter with fluid and monitor leakage.
 - D. Pressurize the converter with a specific air pressure.
76. What is the final procedure when installing a torque converter on a transmission?
- A. Check converter runout.
 - B. Measure crankshaft endplay.
 - C. Torque the drive/flex plate retaining bolts.
 - D. Engaging the pump impeller with the shaft.

77. What should be done if a universal joint bearing cup fails to purge?
- A. Replace universal joint and grease.
 - B. Release seal tension, then apply grease.
 - C. Replace grease zerk and use lighter grease.
 - D. Replace grease zerk and use grease impact.
78. Which procedure should be used to test a powershift transmission which has low driving force in 3rd forward and 3rd reverse?
- A. Verify complaint and test transmission hydraulic flow.
 - B. Road test and test pressure on the forward clutch assembly.
 - C. Road test and test pressure on the low/reverse clutch assembly.
 - D. Verify complaint, then pressure test the speed clutch assembly.
79. To adjust bearing endplay on a transfer case, what steps would the technician follow?
- A. Measure rolling torque and shim to specifications.
 - B. Reuse the original shims to maintain specified endplay.
 - C. Measure endplay with a dial indicator and calculate shim pack.
 - D. Torque the output shaft yoke nut to to achieve specified endplay.
80. What needs to be done to correct a ring and pinion gear pattern which has excessive flank contact?
- A. Move the pinion in.
 - B. Move the pinion out.
 - C. Move the ring gear towards the pinion.
 - D. Move the ring gear away from the pinion.
81. What is the final step when assembling a single-reduction carrier assembly?
- A. Set backlash and check pattern.
 - B. Select and install the pinion-positioning shim.
 - C. Set the thrust screw to the 'high spot' of the bevel gear.
 - D. Check and adjust the depth and preload of pinion shaft bearings.

Section 5

STEERING, SUSPENSION, BRAKE SYSTEMS, WHEEL ASSEMBLIES AND UNDERCARRIAGE

82. What would cause a crawler tractor with a clutch and brake steering system to track to the left all the time?
- A. Worn steering clutch friction disks.
 - B. Incorrect pinion-to-bevel gear position.
 - C. Steering clutch control lever linkage is worn.
 - D. Low hydraulic pressure to the steering clutches.
83. A crawler dozer with an electronically controlled hydrostatic steering system will only make pivot turns to the left whenever the operator tries to move the machine (forward or reverse). What could be causing this problem?
- A. Low battery voltage.
 - B. Low hydrostatic fluid level.
 - C. Poor wiring connection at the motor for the left track.
 - D. Poor wiring connection at the pump for the left track.
84. On an articulating steering system, what would cause the steering wheel to rotate by itself?
- A. Low hydraulic pressure.
 - B. Internal wear in the metering pump.
 - C. A high-pressure leak in the steering pump.
 - D. Steering cylinder piston seals are leaking.
85. What could cause the turning radius to be larger than specified on a differential steering-equipped crawler tractor?
- A. The track tension is too loose.
 - B. The transmission clutches are slipping.
 - C. The steering motor is running too fast during the turn.
 - D. The steering motor is receiving less flow than normal.

86. What would be the possible cause for chattering on the cylinder rod and a noisy pump on a cushion-ride system?
- A. Accumulator charge pressure too low.
 - B. Loose connection on the pump outlet line.
 - C. Hydraulic pump pressure servo valve set too high.
 - D. Loose connection on the oil inlet side of the pump.
87. Which condition will reduce the braking force developed by an air-over-hydraulic booster system?
- A. Leaking vacuum valve.
 - B. Leaking air-pressure inlet valve.
 - C. Closed atmospheric valve.
 - D. Low reservoir air pressure.
88. On a hydraulic brake system, what would cause the indicator light to illuminate accompanied by a low-pedal and poor stopping power?
- A. A faulty brake booster.
 - B. A leak in the hydraulic system.
 - C. A faulty proportioning valve.
 - D. Air in the system.
89. What would cause the brake pedal to creep to the floor after a complete stop, with no external leaks?
- A. A plugged compensating port.
 - B. A faulty cup in the master cylinder.
 - C. Air in the system.
 - D. Worn brake linings.

90. On a hydraulic brake system what would cause the brake pedal to feel "spongy"?
- A. Brakes out of adjustment.
 - B. Weak brake shoe springs.
 - C. Internal master cylinder leak.
 - D. Air trapped in the brake system.
91. Why would wheel nuts continually need re-torquing after short-term use?
- A. Over-torquing.
 - B. Cross-threaded studs.
 - C. Wrong grade wheel nuts.
 - D. Worn stud holes in the rim.
92. What causes track chain pitch to increase?
- A. Sprocket tooth wear.
 - B. Track tension adjustment.
 - C. Internal bushing and pin wear.
 - D. External bushing and chain wear.
93. What should be done before replacing a steering cylinder on an articulating loader?
- A. Disconnect battery and release brakes.
 - B. Relieve pressure from cylinder lines and remove cylinder.
 - C. Drain hydraulic reservoir and remove hydraulic cylinder.
 - D. Thoroughly clean around cylinder and install safety lock bar.
94. What procedure should be followed when replacing a tie-rod end?
- A. Check and adjust caster and camber.
 - B. Thread tie-rod end past slot in tie-rod and adjust camber.
 - C. Thread tie-rod end past slot in tie-rod and adjust toe setting.
 - D. Thread tie-rod end past slot in tie-rod and adjust steering stop.

95. What is the correct order to adjust a power steering box?
- A. Input shaft preload, sector shaft endplay, and adjust poppets.
 - B. Sector shaft endplay, input shaft preload, and adjust poppets.
 - C. Adjust poppets, sector shaft endplay, and input shaft preload.
 - D. Input shaft preload, adjust poppets, and sector shaft input.
96. What are the steps to charge an accumulator?
- A. Isolate and remove accumulator.
 - B. Remove accumulator and check for leaks.
 - C. Discharge accumulator and charge to specification.
 - D. Relieve the hydraulic pressure and charge to accumulator specification.
97. What is the final procedure for adjusting air brakes?
- A. Apply park brake and adjust slack adjuster in direction of brake application.
 - B. Adjust slack adjuster in direction of brake application and check for brake drag.
 - C. Apply park brake and adjust slack adjuster in opposite direction of brake application.
 - D. Adjust slack adjuster in opposite direction of brake application and check for brake drag.
98. What would be the correct procedure to replace a hydraulically released, spring-applied park-brake actuator from a vehicle?
- A. Confine the spring and pressurize the actuator.
 - B. Pump brake pedal five times and remove actuator.
 - C. Relieve the hydraulic pressure and confine the spring.
 - D. Relieve the hydraulic pressure and back off the brakes.
99. What safety precaution should be observed when bleeding the brakes on an air over hydraulic system?
- A. Use correct disposal methods for used brake fluid and replace with new brake fluid.
 - B. Block the wheels and reduce reservoir air pressure.
 - C. Use denatured alcohol to clean hydraulic brake components and check for leaks.
 - D. Drain air tanks and pressurize air system.

100. What precautions must be taken when inflating a multi-piece wheel and tire assembly?
- A. Install wheel and tire assembly then inflate to specifications.
 - B. Install valve core and inflate to 20 psi (140 kPa) to seat the bead.
 - C. Install valve core and inflate tire to maximum pressure to seat bead .
 - D. Cage or confine the wheel and tire assembly and use a remote fill / deflate device.
101. When changing tracks on an elevated sprocket crawler tractor what procedures must be followed for safety?
- A. Release track tension then split track chain.
 - B. Position the master pin at the idler then release track tension.
 - C. Block the machine, change one track, block the machine then change the other track.
 - D. Lift and support the machine with the ripper and the dozer blade, then change the tracks.

Section 6

**ELECTRICAL AND VEHICLE
MANAGEMENT SYSTEMS**

102. What is indicated by excessive amperage draw and slow cranking speed?
- A. A grounded armature.
 - B. An overcharged battery.
 - C. High mechanical resistance.
 - D. High starter cable resistance.
103. What would cause a slow cranking speed and a low amperage draw?
- A. A shorted armature.
 - B. An overcharged battery.
 - C. High mechanical resistance.
 - D. High starter cable resistance.
104. What problem is indicated if the starter armature rotates but the engine does not crank over?
- A. The engine is seized.
 - B. Excessive cranking motor torque.
 - C. Starter drive engagement too deep.
 - D. Starter drive overrunning clutch slippage.
105. What would cause alternator output to drop below specifications?
- A. Drive belt slippage.
 - B. A discharged battery.
 - C. Excessive electrical loads.
 - D. Voltage regulator adjustment.

106. What would cause a three speed heater to only operate on the low and high speed positions?
- A. The motor speed selector switch is open.
 - B. There is an open in the motor resistor block.
 - C. There is an open in the motor ground circuit.
 - D. There is excessive resistance in the motor windings.
107. If a pair of work lights are wired in parallel, what would cause one to operate with less intensity than the other?
- A. Supply wire gauge too small.
 - B. High resistance in the light switch.
 - C. A high resistance ground connection.
 - D. Insufficient fuse or circuit breaker rating.
108. What would cause a "type one" circuit breaker to repeatedly cycle on and off?
- A. Voltage regulator setting too high.
 - B. A loose connection in the ground circuit.
 - C. An increase in current flow due to a short circuit.
 - D. A loose connection at the positive battery terminal.
109. What is the correct procedure to load test a battery?
- A. Load battery at $\frac{1}{2}$ the cold cranking amps for 15 seconds and record voltage.
 - B. Load battery at $\frac{1}{2}$ the cold cranking amps for 30 seconds and record voltage.
 - C. Load battery at $\frac{1}{2}$ the cranking amps for 15 seconds and record voltage.
 - D. Load battery at $\frac{1}{2}$ the cranking amps, voltage should remain above 9.6 V.
110. What is the correct procedure for checking alternator output on the unit?
- A. Run engine at 1 000 rpm, turn off all loads and check maximum voltage.
 - B. Run engine at 1 000 rpm and load alternator to produce maximum voltage.
 - C. Turn off all loads and full field the alternator to produce maximum voltage.
 - D. Run engine at 1 000 rpm and load alternator to produce maximum current.

111. What should be used to produce a sealed, low resistance splice in a wiring harness conductor?
- A. A western union splice.
 - B. Solder and shrink tubing.
 - C. A splice clip and shrink tubing.
 - D. A butt connector and silicone sealant.
112. What is the first step when diagnosing an electronic control system malfunction?
- A. Connect a scan tool and test fault related circuits.
 - B. Install a test ECM and run a system functional test.
 - C. Connect a scan tool and read active diagnostic fault codes.
 - D. Connect a scan tool and read inactive diagnostic fault codes.
113. Which procedure would be used to capture relevant data when diagnosing an intermittent fault?
- A. Set up scan tool for a snapshot.
 - B. Use scan tool to activate outputs.
 - C. Set up scan tool to read specific parameters.
 - D. Set up a scan tool to capture fault related events.
114. What should be done if the check engine (yellow) dash light is illuminated?
- A. Install a test ECM.
 - B. Test all circuits related to the fault.
 - C. Repair the system for active fault codes.
 - D. Repair the system for historical fault codes.
115. What would be the cause of a high voltage code on a two-wire temperature sensor circuit?
- A. Shorted sensor.
 - B. Open sensor circuit.
 - C. Shorted sensor harness.
 - D. High resistance ground connection.

116. What type of test equipment should be used when performing voltage and continuity tests on an electronically controlled computer system?
- A. LED test light.
 - B. Analog multimeter.
 - C. Low impedance digital multimeter.
 - D. High impedance digital multimeter.
117. What measurements are taken to determine if the output signal from a pressure sensor is within range?
- A. ECM power supply voltage.
 - B. Voltage in relation to pressure change.
 - C. Resistance in relation to pressure change.
 - D. Frequency in relation to pressure change.
118. What must be entered when recalibrating electronic system parameters?
- A. Equipment hours.
 - B. Engine serial number.
 - C. Equipment model number.
 - D. A customer or manufacturers password.
119. What must be done when replacing a sensor?
- A. Program the ECU to accept the new sensor.
 - B. Torque the sensor to manufacturer's specifications.
 - C. Disconnect the battery then disconnect the sensor.
 - D. Ground the housing to remove ESD (electro-static discharge).
120. What must be done before opening a connection in the sensor harness of an electronic control system?
- A. Record the wiring colour code.
 - B. Ensure the key switch is turned off.
 - C. Bring the system to operating temperature.
 - D. Use a high impedance digital multi-meter.

Section 7

ENVIRONMENTAL CONTROL SYSTEMS

121. What would cause low output from the heater core?
- A. Low coolant level.
 - B. A faulty radiator cap.
 - C. Air in the evaporator core.
 - D. Heater control valve stuck open.
122. When moving the heater control from hot to cold what would cause no change in vent temperature?
- A. Faulty compressor relay.
 - B. Plugged heater core.
 - C. Plugged evaporator core.
 - D. Improper heater valve adjustment.
123. What is the problem when the air conditioning system starts working normally then the vent temperature slowly starts to warm up?
- A. Thermostatic switch stuck closed.
 - B. Thermostatic switch stuck open.
 - C. Faulty thermal expansion valve.
 - D. Faulty compressor clutch.
124. What would be indicated by a whistling noise in the cab when the heater fan is on high speed?
- A. Cab air filter is plugged.
 - B. Leaking window or door seals.
 - C. The hot air door actuator is leaking.
 - D. The fan blades are touching the housing.

125. Which test is used to verify a plugged heater core before removal?
- A. Pressure test the cooling system.
 - B. Measure pressure drop across heater core.
 - C. Compare the inlet and outlet temperatures.
 - D. Measure the flow through the heater core.
126. Which procedure would be used to repair a musty/stale odour in the operator's station (cab)?
- A. Replace the heater core.
 - B. Replace the dash vent piping.
 - C. Adjust the defrost blend door.
 - D. Clean the evaporator core drain.
127. What is the first step when evacuating refrigerant from an air conditioning system?
- A. Check the refrigerant oil level.
 - B. Identify the type of refrigerant.
 - C. Measure the weight of the refrigerant.
 - D. Check the high side and low side pressures.
128. What equipment is used to test for noise in the operator's station?
- A. A smoke meter.
 - B. A decibel meter.
 - C. A light generator.
 - D. An insulation gauge.

Section 8

STRUCTURAL COMPONENTS, ACCESSORIES AND ATTACHMENTS

129. How are cracks detected in frame components?
- A. Ultra-sound testing.
 - B. A dye-check process.
 - C. A measuring process.
 - D. Hydrostatic pressure testing.
130. What are two purposes of the screening used on operator stations?
- A. Keeping the operator in the structure and preventing the structure from collapsing.
 - B. Preventing outside objects from entering the operator area and reducing the operators exposure to noise.
 - C. Preventing the structure from collapsing and increasing side strength in a rollover situation.
 - D. Keeping the operator inside the structure and preventing outside objects from entering the operator area.
131. After equipment service, the fire suppression system went into the automatic discharge cycle when the Electronic Control Unit was reconnected the system. What is the cause?
- A. Welding was performed too close to the linear detection wire.
 - B. A manual actuator was accidentally pushed in because it did not have the safety pin installed.
 - C. The fire suppression system backup battery has been installed with reverse polarity.
 - D. A pressure line from the gas activation cylinder was damaged during repairs.

132. What are the steps for measuring wear on a loader's articulated pivot pins and bearings?
- A. Raise and lower the centre pivot while measuring bearing wear with a dial indicator.
 - B. Elevate and lower the front of the machine with the bucket while measuring wear with a dial indicator.
 - C. Raise the rear pivot section and measure the bearing clearance with a feeler gauge.
 - D. Use the steering cylinders to rock the pivot point back and forth while checking the bearing clearance with a dial indicator.
133. When can modifications be performed on a FOPS/ROPS system?
- A. Only when they are done by a licensed welder.
 - B. As long as heavier gauge metal is used.
 - C. With approval for the modification from the machine manufacturer.
 - D. Modifications must be approved by the owner of the machine.
134. What dozer blade cutting edge installation procedure must be done to prevent elongation of the bolt holes in the blade?
- A. Remove all paint from both sides of the cutting edge before installation.
 - B. Lift the blade slightly with the machine hydraulics when installing the cutting edge.
 - C. Remove all dirt, rust and paint from the cutting edge and blade mating surfaces.
 - D. Feel the fastener openings to check for proper cutting edge to blade alignment.
135. What is the general rule for attaching accessories to FOPS/ROPS systems?
- A. Install the accessories so servicing is as easy as possible.
 - B. The installation must not make the FOPS/ROPS structure more or less rigid.
 - C. Consult the equipment owner before making any installation.
 - D. Place accessories as close to load bearing joints as possible to reduce vibration.