

Area Agricultural Technology & Mechanical Systems Career Development Event

Texas Agricultural Technology & Mechanical Systems Committee
April 2013 Theme: Agricultural Bio-solids Processing
Superintendent – Dr. Ryan Saucier

Instructions: The written exam for the Area CDE consists of 100 multiple-choice questions worth one point each. You have 60 minutes to complete the exam; select the most appropriate answer, completely bubble in the proper place on the scantron erase clearly and don't tear the scantron. DON'T WRITE ON THE EXAM! Thank you & Good luck.

1. Operator's manuals recommend filling fuel tanks at the end of each day to _____.
 - a. allow trash to settle to the bottom
 - b. prevent trash from entering fuel lines
 - c. reduce moisture condensation
 - d. reduce the need for a fuel filter
2. Loaders and tractors are calibrated to record the _____.
 - a. acres per day
 - b. acres per hour
 - c. hours per day
 - d. hours of operation
3. The correct sequence for a four-stroke cycle engine is _____.
 - a. exhaust, power, intake, compression
 - b. intake, compression, power, exhaust
 - c. intake, power, compression, exhaust
 - d. power, exhaust, compression, intake
4. The engine flywheel _____.
 - a. lessens the vibration of the crankshaft
 - b. stores energy between power strokes to maintain momentum
 - c. both a and b
 - d. neither a nor b
5. A dairy cow produces about 1.6 ft³ of manure per day. If you are milking 325 cows, they will produce about _____ of manure in one year.
 - a. 29,340 ft³
 - b. 175,200 ft³
 - c. 189,800 ft³
 - d. 204,204 ft³
6. To provide safety when operating utility tractors, moving parts should be _____.
 - a. labeled
 - b. oiled
 - c. painted
 - d. shielded
7. _____ screws have un-slotted heads.
 - a. lag
 - b. oval
 - c. pan
 - d. round

8. Rural wastewater and runoff management in Texas is one of the responsibilities assigned to _____.
a. TCEQ
b. TCHR
c. TIRS
d. TRSA
9. The self-tapping screws used to attach shields to structural members of loaders are called _____.
a. carriage bolts
b. drywalls crews
c. lag screws
d. Tek screws
10. 8. There are _____ in one acre.
a. 4400 square yards
b. 5280 square feet
c. 43560 square feet
d. 45360 square yards
11. All except _____ are agricultural applications of GPS technology.
a. boundary mapping
b. field scouting
c. circuit testing
d. soil testing
12. Architect's, drainage, dumpy, and wye are types of _____.
a. plumbing connections
b. tillage products
c. tripod levels
d. water containment ponds
13. You purchase a used loader for \$18,000. You expect to keep the loader for 7 years, and anticipate a salvage value of \$3,000 at that time. The approximate monthly cost of owning the loader for those 7 years is _____.
a. \$158.00
b. \$178.00
c. \$208.00
d. \$225.00
14. Safety alert symbols and signal words are used on front-end loaders to identify hazards. The most hazardous condition is identified by the word _____.
a. careful
b. caution
c. danger
d. warning
15. When using the bucket attachment of a front-end loader, the center of gravity:
a. lowers because the weight of the load anchors the tractor to the ground
b. raises as the load lowers
c. raises as the load raises
d. stays at the same level regardless of the load's height and weight.

16. The formula for calculating horsepower is W (lbs.) \times D (ft.) \times T (sec.) divided by ____.
- 10
 - 50
 - 500
 - 550
17. The use of fluid to transfer power from a tractor to a front-end loader is called:
- biologics
 - hydraulics
 - mnemonics
 - nanotics.
18. The first step in operating a front-end loader is to:
- make sure the lights work properly
 - make sure there is no one behind the tractor
 - read the operator's manual
 - start the machine to get the 'feel' of it
19. OSHA requires hearing protection if the noise level from tractor operation exceeds:
- 80 decibels for 8 hours
 - 90 decibels for 8 hours
 - 95 decibels for four hours of more
 - both B and C
20. Most dry element air cleaners are composed of a primary and a secondary filter. A dirty secondary filter indicates that:
- the primary filter is brand-new
 - the primary filter needs cleaning
 - the primary filter is damaged
 - the secondary filter has reached the recommended service interval
21. A composter plans to spread dairy manure on a stubble field that covers 630,600 square feet, or ____ acres.
- 14.5
 - 65.5
 - 120.0
 - 146.45
22. The standard unit for measuring bio-solids to be moved by a loader is the_____.
- cubic foot
 - cubic yard
 - square foot
 - square yard
23. Small engines require the richest air-fuel mixture at:
- full load
 - high idle
 - low idle
 - start-up
24. Intake and exhaust valves in small engines open and close by the action of the ____.
- bearings
 - camshaft
 - throttle
 - wrist pin

25. The type of leveling used to determine distances in elevation at measured intervals along a line, important for calculating drainage, is called _____ leveling.
- gradient
 - profile
 - slope
 - terrace
26. Correcting an ignition or fuel malfunction is commonly referred to as a _____.
- major overhaul
 - quick fix
 - top overhaul
 - tune up
27. Using the formula $MPH = (\text{travel distance in feet}) / (\text{travel time in seconds}) / \text{divided by the constant } 1.466$, the ground speed of a tractor and front-end loader that travel 135 feet in 17 seconds is _____.
- 5.006 mph
 - 5.155 mph
 - 5.416 mph
 - 5.765 mph
28. The approximate ground speed of a tractor and front-end loader that travel 600' in 54 seconds is _____.
- 4.876 mph
 - 5.778 mph
 - 6.875 mph
 - 7.578 mph
29. The ignition quality of a diesel fuel is the _____ rating.
- cetane
 - hydrocarbon
 - octane
 - saturation
30. In profile leveling, the first reading taken after moving and re-leveling is the _____.
- back sight
 - bench mark
 - fore sight
 - turning point
31. When operating a tractor and front-end loader on a public road or highway, it is necessary to _____.
- use any required warning device
 - use a SMV emblem
 - use warning lights
 - all of the above
32. Use a precision instrument such as a _____ to check the diameter of crankshaft journals, piston pins, camshafts, and valve stems to one one-thousandth of an inch.
- cylinder gauge
 - inside micrometer
 - outside micrometer
 - telescoping gauge

33. A _____ is a useful tool for determining the slope and drainage of containment areas.
- land plane
 - shovel
 - slope potentiometer
 - tripod level
34. A twisting force, calculated by multiplying force X length of lever, is called _____.
- energy
 - force
 - torque
 - work
35. A section of land contains _____ acres.
- 160
 - 640
 - 1000
 - 5280
36. A 326,570 square foot field provides _____ acres for spreading cattle manure.
- 7.49
 - 14.59
 - 27.30
 - 61.85
37. Performing scheduled routine services & checks on a front-end loader is called _____.
- a pre-operation checklist
 - preventive maintenance
 - service work order
 - a tune-up
38. When operating a front-end loader, set rear wheels at _____ width to increase stability.
- makes no difference
 - maximum
 - medium
 - minimum
39. You purchase a used JD 48 front-end loader attachment for your poultry operation for \$2900 and 6% interest with dealer financing. If you plan to pay for the loader over three years, the annual payment is _____.
- 522.80
 - 966.67
 - 1024.67
 - 1140.67
40. All tractors equipped with front-end loaders have ROPS, an acronym for _____.
- random operation procedure system
 - rear operator position signal
 - regular operation procedure signal
 - roll over protective structure
41. A tractor & front-end loader moving at 470 fpm is traveling at a rate of _____ MPH.
- 3.3
 - 4.3
 - 5.3
 - 6.3

42. The lowest temperature at which a lubricant will flow is the _____ point.
- cloud point
 - dispersal point
 - pour point
 - viscosity grade
43. Cattle manure accumulates at the rate of 1.6 cubic feet per head per day. Approximately _____ cubic feet of manure can accumulate in 30 days if a producer has 1000 cows in a milking string.
- 44,800
 - 46,400
 - 48,000
 - 49,600
44. Service recommendations specify 84 inch-pounds of torque on the bolts holding the hydraulic lines in place on your front-end loader. Your torque wrench only reads in foot-pounds. Which setting should you use?
- 7.0 ft-lbs
 - 8.4 ft-lbs
 - 10.8 ft-lbs
 - none of the above
45. The engine component that attaches the piston and the crankshaft to convert reciprocating motion into rotary motion is called the _____.
- camshaft
 - connecting rod
 - crankshaft insert
 - lifter rod
46. MSDS stands for _____.
- Material safety data sheets
 - Mixed spray delivery system
 - Mixed silage digestibility supplement
 - Multiple spray drift safety
47. When using ASABE hand signals to communicate with others when working around front-end loaders, moving the right arm across the neck from left to right in a throat-cutting motion means _____.
- raise the bucket to this level
 - start the engine
 - stop the engine
 - stop forward travel
48. The mechanism used to transfer power from an engine to a machine is the _____.
- clutch assembly
 - clutch housing
 - drive train
 - transaxle
49. The oil viscosity grade with the slowest flow rate is _____.
- SAE 10
 - SAE 20
 - SAE 30
 - SAE 40

50. Forces exerted parallel to a shaft or moving surface are _____.
a. axial loads
b. compression loads
c. radial loads
d. vertical loads
51. The temperature at which diesel fuel ceases to flow is the _____.
a. cloud point
b. drift point
c. expansion point
d. pour point
52. The purpose of free travel on a clutch pedal is _____.
a. increase pressure on the pressure plate
b. allow friction disc to contact flywheel at all times to prevent engine over speeding
c. prevent the release bearing from constantly running against the clutch
d. allow the hydraulics to function normally
53. When working around front-end loaders, the ASABE hand signal of pointing upward with the forefinger while making a circle with the hand level with the head means _____.
a. come to me
b. raise the bucket action
c. speed up the engine
d. stop the engine
54. The number one enemy of a loader's hydraulic system is _____.
a. dirt, water and foreign matter
b. improper positioning
c. over-heating
d. over-loading
55. A drive sprocket with hooked teeth _____.
a. is used with single pitch chains
b. is used with H-type chains
c. is used with double-pitch roller chains
d. should be replaced due to excessive wear.
56. Use a _____ to diagnose the charging circuit output of a loader.
a. digital multimeter
b. hydrometer
c. microscope
d. oscilloscope
57. API classifications for oils used in compression ignition engines include the letter(s) _____.
a. C
b. S
c. SAE
d. SF
58. A type of fastener probably NOT used on a front-end loader is the _____.
a. cap screw
b. lag screw
c. machine bolt
d. TEK screw

59. Sticking your head or arms through the boom arms, lift cylinders and frame of a front-end loader creates a _____ hazard.
- pinch point
 - pull in point
 - shear point
 - wrap point
60. The term that indicates the quality rating of diesel fuel is the _____.
- cetane rating
 - hydrocarbon rating
 - octane rating
 - saturated hydrocarbon rating
61. An “operator presence” safety interlock system on a loader is designed to _____.
- allow the loader to be operated by remote control in hazardous situations
 - not allow the engine to start without the operator being properly seated in the operator’s seat and seat belt fastened
 - sound a buzzer before the loader backs up
 - none of the above
62. There are _____ cubic feet of bio-solid in 1 cubic yard.
- 9
 - 12
 - 15
 - 27
63. The cubic inch displacement (CID) of a single-cylinder engine with a 3.5 inch bore and 4-inch stroke is _____.
- 2.57
 - 38.48
 - 14.02
 - 56.58
64. The ‘W’ in 10W-40 lubricating oil stands for _____.
- wash
 - weather
 - weight
 - winter
65. The bottom piston ring on a four-stroke-cycle engine helps control _____.
- engine noise
 - compression loss
 - valve guide wear
 - oil consumption
66. Piston ring end gap is used to indicate _____.
- number of hours of service
 - clearance between the piston and cylinder wall
 - clearance volume of an engine
 - amount of wear on rings and/or cylinder wall

67. The terms that most accurately describe the roles of engine oil are _____.
a. lubrication, ballasting, sealing, and cleaning
b. lubrication, cooling, sealing, and cleaning
c. lubrication, cooling, sealing, and powering
d. lubrication, cooling, repairing, and cleaning
68. The lubricating characteristic of engine oil serves to reduce _____.
a. contaminants
b. condensation
c. emissions
d. friction
69. When engine oil seals the piston rings to the piston and the piston rings to the cylinder wall, _____ is increased.
a. compression
b. combustion
c. ignition
d. exhaust
70. The fraction of all agricultural tractor fatalities nationwide due to rollovers is _____.
a. $\frac{1}{5}$ (one fifth)
b. $\frac{1}{4}$ (one fourth)
c. $\frac{1}{3}$ (one third)
d. $\frac{1}{2}$ (one half)
71. Use extreme caution when operating front-end loaders near ditches or on hillsides where a/an _____ can occur.
a. exposure
b. injury
c. rollover
d. sunburn
72. A _____ bolt resembles a threaded rod, with no head on either end.
a. carriage
b. machine
c. stove
d. stud
73. To get correct torque values when tightening bolts on a front-end loader, _____.
a. clean external threads
b. clean internal threads
c. clean internal & external threads
d. clean threads don't matter.
74. The most effective product(s) for cleaning foam (sponge-type) air filters is/are _____.
a. gasoline
b. naphtha
c. carbon tetrachloride
d. soap and water
75. The part of the small engine carburetor that controls engine speed is the _____.
a. choke
b. venture
c. float
d. throttle

76. The grade of bolt with the highest tensile strength is _____.
a. US grade #1
b. SAE Grade 8
c. Grade 5-TS
d. Grade 20X
77. A partially sheared flywheel key on a small gas engine will change the _____.
a. valve timing.
b. carburetor air-fuel mixture.
c. ignition timing.
d. oil pressure.
78. When a four-stroke cycle engine is on the intake stroke, the _____.
a. piston will be moving upward in the cylinder
b. exhaust valve will be open
c. piston will be moving downward in the cylinder
d. intake valve will be closed
79. Drive chains may be adjusted by _____.
a. removing links
b. adding links
c. moving an idler pulley
d. all of the above
80. As a safety rule of thumb, tilt the bucket slightly _____ as the lift arms raise to prevent spilling broiler litter from the loader bucket.
a. backward
b. down
c. forward
d. up
- IMS #8790
81. There are _____ feet on one mile.
a. 5082
b. 5280
c. 5333
d. 5820
82. Spreading manure over an area of _____ acres is equal to covering 631,620 ft².
a. 14.50
b. 63.16
c. 145.45
d. 119.63
83. A slip clutch is designed to protect the drive train; _____ this protection.
a. over-tightening decreases
b. over-tightening increases
c. under-tightening decreases
d. slip clutches are self-adjusting
84. Lubrication intervals are based on normal operating conditions; severe or unusual conditions may require _____ intervals
a. shorter
b. longer
c. same length
d. all of the above

85. Diesel fuel ignition is caused by _____.
a. compression
b. spark plug
c. flame
d. friction
86. The oil recommended for use in a gasoline engine is type _____.
a. CA
b. CB
c. CC
d. SF
87. The condenser in a magneto ignition system _____.
a. regulates voltage to the points
b. protects the secondary circuit
c. protects the points by reducing arcing
d. improves the starting torque of the engine
88. Use _____ to check for leaks of high pressure fluids.
a. your hand
b. a piece of paper
c. soap solution
d. water bubbles
89. Use a _____ to make bolts and screws complete metal-to-metal fasteners.
a. nuts
b. rivets
c. threads
d. washers
90. Self-tapping screws are available with both pointed and _____ ends.
a. blunt
b. pilot
c. plain
d. TEK
91. The allowable intake valve clearance is .005" - .007"; actual intake valve clearance is measured at .002". To address this issue, the service technician should _____.
a. install a new valve with a longer stem
b. grind the valve seat an additional .004 inches
c. grind the valve face an additional .004 inches
d. grind the valve stem end to the correct length
92. When safely working with loader tires, statement _____ is FALSE.
a. always maintain correct tire pressure
b. repair wheels by welding
c. if available, use a safety cage to inflate tires
d. use a clip-on chuck and long extension hose to allow you to stand to one side.
93. A concrete apron used for holding manure before removal covers 45,000 square feet, or _____ acres.
a. 0.80
b. 0.95
c. 1.03
d. 1.20

94. The formula for determining ground speed of a front-end loader is _____.
 a. $\text{MPH} = \frac{\text{distance traveled (ft)} / \text{travel time (sec)}}{1.466}$
 b. $\text{MPH} = \frac{\text{miles per hour} / \text{travel time (sec)}}{1.466}$
 c. $\text{MPH} = \frac{\text{distance traveled (yards)} \times \text{travel time (sec)}}{1.466}$
 d. none of the above
95. A tractor & front-end loader is moving at the rate of 300 feet per minute, or _____ MPH.
 a. 1.8
 b. 3.4
 c. 5.0
 d. 6.2
96. Centrifugal force can cause skid-steer loaders to overturn when the center of gravity is moved higher, the points where the wheels contact the ground become narrower and/or shorter, and _____.
 a. travel speeds decrease
 b. travel speeds increase
 c. engine horsepower increases
 d. dumping the load while in a stationary position.
97. One cubic yard of bio-product is sufficient to fill a pit that is approximately _____.
 a. 3' X 3' X 4"
 b. 9' X 9' X 4"
 c. 12' X 12' X 4"
 d. none of the above
98. When performing preventive maintenance on a front-end loader, the technician should always _____.
 a. lower the boom to ground level or as low as possible
 b. use boom safety lock pins or lock-blocks when it is necessary to get under a raised boom or bucket
 c. set the parking brake
 d. perform all of the above
99. Nation-wide, about _____ of all agricultural work fatalities are due to tractor-related accidents.
 a. 1/5
 b. 1/4
 c. 1/3
 d. 1/2
100. When a front-end loader starts to tip forward with the boom in the raised position _____.
 a. immediately lower the boom and try to regain load stability
 b. immediately drive forward to shift the weight of the load to the rear tires
 c. lock the brakes to prevent a skid
 d. immediately lock your seat belt so you are not thrown out of the cab