

Texas FFA Agricultural Mechanics Career Development Event

Area X Competition

Hosted by Texas A&M University - Kingsville

Sponsors: Agricultural Consortium of Texas

Texas Agricultural Mechanics Committee

April 10, 2007

Superintendent – Jerome Tymrak

Theme for 2007 - Materials Handling

Instructions: Congratulations on competing in the Area X CDE. The written exam for the Agricultural Mechanics CDE consists of 100 multiple-choice questions worth one point each. You have 60 minutes to complete the exam. Make sure you are answering the questions in the proper place on the scantron and see that you are marking completely. Please erase clearly and don't tear the scantron sheet. **DO NOT WRITE ON THE EXAM!** Thank you. Good luck.

1. Which method is most commonly used to prevent crankshaft damage in small air-cooled gasoline engines? (Harrell)
 - a. adjustable wheels
 - b. flywheel key
 - c. magneto shaft
 - d. PTO shaft

2. To check the diameter of crankshaft journals, piston pins, camshafts, and valve stems to accuracies of 0.001", use a: (IMS #8780-A)
 - a. cylinder gauge
 - b. inside micrometer
 - c. outside micrometer
 - d. telescoping gauge

3. Safety alert symbols are using during the operation of round balers to identify hazards. The word that indicates the most potentially dangerous hazard is: (IMS #8790)
 - a. Caution!
 - b. Danger!
 - c. Warning!
 - d. Watch out!

4. Extinguish an oil-based fire on a small gasoline engine with a: (IMS #8790)
 - a. type A fire extinguisher
 - b. type B fire extinguisher
 - c. type C fire extinguisher
 - d. type D fire extinguisher

5. There are _____ in one acre.
 - a. 5,280 linear feet
 - b. 4,400 square yards
 - c. 43,560 square feet
 - d. 45,360 square yards

6. The first step in safely operating a round baler is to:
 - a. ensure the lights work properly
 - b. ensure no one is behind the baler
 - c. start the tractor and pull the baler around to get a “feel” for it
 - d. read the operator’s manual

7. Recommended servicing of a round baler consists of:
 - a. preventive maintenance during baling season
 - b. pre-season inspection
 - c. regular maintenance & repair at the end of baling season
 - d. all of the above

8. Which SAE grade of standard steel bolts has the highest tensile strength and torque specifications? (IMS #8414)
 - a. grade 0
 - b. grade 1
 - c. grade 5
 - d. grade 8

9. The ASABE hand signal that involves moving the right arm across the neck in a “throat-cutting” motion means: (IMS #8790)
 - a. raise the gate to the bale chamber this high
 - b. start the tractor engine
 - c. stop forward travel
 - d. stop the tractor engine

10. The use of fluid to transfer power from a tractor to a round baler is called: (IMS #8796)
 - a. biologics
 - b. hydraulics
 - c. mnemonics
 - d. pneumatics

11. The approximate speed in MPH of a tractor and round baler that cover 600 feet in 54 seconds is: (IMS #8221)
 - a. 4.876
 - b. 5.778
 - c. 6.875
 - d. 7.578

12. One horsepower is the amount of force needed to: (IPC)
 - a. lift 550 lbs. one foot in one second
 - b. lift 33,000 lbs. one foot in one minute
 - c. both **a** and **b**
 - d. neither **a** nor **b**

13. A drive sprocket with hooked teeth indicates that: (FOS Belts & Chains)
 - a. the sprocket should be used with single-pitch chains
 - b. the sprocket should be used with pintle or H-type chains
 - c. the sprocket should be used with double-pitch roller chains
 - d. the sprocket is worn & should be replaced.

14. Speed conversion drives can be used to drive equipment at a different speed from that produced by a small air-cooled gasoline engine. Which is NOT a type of speed conversion drive? (IMS #8795)
- chain and sprocket
 - flange coupling
 - gear
 - pulley & belt
15. There are _____ linear feet in one mile.
- 5082
 - 5280
 - 5333
 - 5820
16. The lowest point at which lubricating oil will flow is the: (IMS #8794C)
- cloud point
 - dispersant point
 - pour point
 - viscosity grade
17. The small engine component that attaches a piston to a crankshaft and converts reciprocating motion to rotary motion is called a: (IMS #8203-A)
- camshaft
 - connecting rod
 - crankshaft
 - lifter rod
18. A 540 RPM PTO shaft has _____ splines. (Harrell)
- 6
 - 7
 - 8
 - 10
19. A Type II PTO shaft rotates at _____. (IMS #8204-A)
- 540
 - 650
 - 880
 - 1000
20. One gallon is equal to _____ fluid ounces. (IMS #4320)
- 32
 - 68
 - 128
 - 230
21. To provide safety when operating round balers, moving parts should be: (IMS #8792)
- labeled
 - oiled
 - painted
 - shielded.

22. How fast is a tractor operating a round baler moving if it travels 300' in one minute?
- 1.8 mph
 - 3.4 mph
 - 5.0 mph
 - not enough information to determine answer
23. The Society of Automotive Engineers (SAE) designates the: (IMS #8794C)
- classification of engine oils
 - combustion range of hydrocarbons
 - detergent index of engine oils
 - viscosity ranges of engine oils & gear lubricants
24. The seals used on the pistons of hydraulic cylinders on round balers are probably:
- compression seals
 - diaphragm seals
 - O-ring and backup seals
 - Radial lip seals
25. You are interested in purchasing a used 2003 JD 567 round baler. The asking price is \$21,100 and 6% simple interest with dealer financing. If you take 7 years to pay for the baler, how much is the annual payment?
- \$3000
 - \$3195
 - \$3380
 - \$3500
26. A hay field is 630,620 square feet in area, or _____ acres.
- 13.8
 - 14.5
 - 119.5
 - 143.8
27. If a small gasoline engine has insufficient compression, check:
- the ignition system
 - to see if the flywheel is properly mounted
 - to see if the spark plug is loose
 - to see if an oil additive is needed
28. Which engine oil viscosity grade has the slowest flow rate? (IMS #8794C)
- SAE 10
 - SAE 20
 - SAE 30
 - SAE 40
29. Forces exerted parallel to a shaft or moving surface are called: (IMS #8202A)
- axial or thrust loads
 - compression loads
 - radial loads
 - vertical loads

30. A Type II PTO shaft has _____ splines. (IMS #8204A)
a. 18
b. 20
c. 21
d. 24
31. If the baler pickup is not picking up hay cleanly, the problem may be _____. (FMO)
a. bent or broken pickup teeth
b. ground speed too slow
c. pickup teeth set too high
d. either a or c
32. The richest air-fuel mixture is required at small gasoline engine: (IMS #8793B)
a. full load
b. high idle
c. low idle
d. start up
33. You wish to purchase a used New Holland 688 baler. The asking price is \$7000, at 6% simple interest with dealer financing. IF you pay off the baler in 3 years, about how much is the annual payment?
a. \$2300
b. \$2475
c. \$2650
d. \$2850
34. Shiny or burned spots on a flat belt generally indicate: (FOS Belts & Chains)
a. excessive tension
b. insufficient tension
c. misaligned belt guides
d. misaligned pulleys
35. You are a custom operator, and are considering the purchase of a used Hew Holland 688 baler for \$11,500. If you charge \$15 per bale, and allow for a salvage value of \$3000, how many bales must you roll annually to pay off the baler in three years?
a. 150
b. 166
c. 188
d. 544
36. An SAE viscosity rating of 10W-40 indicates that: (FOS Fuels & Lubricants)
a. the lubricant is lighter & more fluid in cold weather
b. the lubricant is heavier & less fluid in hot weather
c. the lubricant should be used with type W engines
d. both A and B
37. When should ANSI approved eye protection be used? (IMS #8790)
a. when cleaning baler belts
b. when replacing bearings
c. when replacing pickup teeth
d. any time you are working in agricultural mechanics

38. One mile per hour (mph) is the equivalent of _____ feet per minute.
- 88
 - 640
 - 1620
 - 5280
39. How fast is a baler moving if it is pulled 300 feet in 60 seconds? (IMS #8792)
- 0.2 MPH
 - 1.8 MPH
 - 3.4 MPH
 - 5.0 MPH
40. When necessary to tow a round baler on a public road or highway, always
- use clearance and warning lights
 - use all required warning devices
 - display an SMV emblem appropriately
 - all of the above.
41. OSHA requires hearing protection if the noise level exceeds _____. (FBM Safety)
- 50 decibels for 8 hours
 - 90 decibels for 8 hours
 - 95 decibels for 4 hours or more
 - Both **b** and **c**.
42. The proper sequence of events in a 4-stroke cycle engine is:
- exhaust, power, intake, compression
 - intake, compression, power, exhaust
 - intake, power, compression, exhaust
 - power, exhaust, compression, intake
43. The work output of small gasoline engines is measured in _____. (IMS #8793B)
- cubic centimeters
 - horsepower
 - rpm
 - watts
44. According to the Briggs & Stratton engine repair manual, the air filter pre-cleaner of a small engine should be cleaned at least every _____.
- 10 hours
 - 15 hours
 - 20 hours
 - 25 hours
45. Hydrocarbons in lubricating oil combine with oxygen in the air to produce organic acids in a process called: (FOS Engines)
- bypass insurgency
 - carbonization
 - corrosion
 - oxidation.

46. Which factor is NOT used to classify hay balers? (IMS #8792A)
- bale size & type
 - drive source
 - ejector type
 - type of tie
47. The spinner-type PTO safety shield will: (Harrell)
- allow the operator to change shaft speed & direction while in operation
 - eliminate all danger from PTO shafts
 - only function properly under 600 rpm
 - stop when touched, but allow the PTO shaft to continue rotation inside
48. The flywheel of a small gasoline engine: (IMS #8793-A)
- smoothes out the speed of the crankshaft
 - stores energy to maintain momentum between power strokes
 - both a and b
 - neither a nor b
49. Round balers are calibrated to record: (IMS #8792E)
- acres per hour
 - hours of operation
 - hours per week
 - number of bales
50. The relationship between cylinder volume when the piston is furthest from the cylinder head to cylinder volume when the piston is closest to the cylinder head is called:
- compression ratio
 - fuel efficiency
 - octane rating
 - volumetric efficiency
51. You stand to inherit an older baler, valued at \$3,000, that needs some work. You will spend about \$375 in repair costs, and estimate that it will cost about \$115 per hay season in repairs & maintenance. You also estimate it costs you about \$5 per bale to roll your own hay. How many bales must you put up in three years to cover the cost of the baler, plus repair and maintenance costs? (FBM Machinery Mgmt)
- 144
 - 444
 - 744
 - 1044
52. Which of the following factors has the least effect on the quality and quantity of hay baled?
- brand of baler
 - condition of hay in the field
 - field condition
 - skill of operator
53. When baling hay, it is important to wear all of the following except:
- baggy clothes
 - closed-toe shoes or boots
 - gloves
 - safety glasses or goggles

54. Using the formula $MPH = (\text{distance traveled in feet}) \div (\text{travel time in seconds}) \div 1.466$, the ground speed of a baler that travels 135 feet in 17 seconds is:
- 5.006
 - 5.155
 - 5.416
 - 5.765
55. A section of land contains: (IMS #8772)
- 160 acres
 - 640 acres
 - 1000 acres
 - 5280 acres
56. On a model 92902 Briggs & Stratton engine, the first 9 indicates: (B&S Repair Manual)
- arrangement of crankshaft
 - cubic inch displacement of engine
 - flywheel diameter
 - type of starter
57. An oil not produced by extraction or refinement is a: (FOS Fuels & Lubricants)
- grease
 - remanufactured oil
 - synthetic oil
 - viscous oil
58. The performance of scheduled routine maintenance services and checks outlined in the operator's manual is called: (Harrell)
- pre-operational checks
 - preventive maintenance
 - service work order
 - tune-up
59. Properly-serviced air cleaners remove _____ or more of the dirt and other solid particles in the air. (Harrell)
- 85
 - 90
 - 95
 - 99
60. The standard compression ratio for small engines ranges from: (IMS #8793B)
- 6:1 to 8:1
 - 9:1 – 11.5:1
 - 14:1 – 16:1
 - 20:1 – 22:1
61. A valuable tool for measuring the size and slope of hay fields is the: (IMS #8772)
- land plane
 - shovel
 - slope potentiometer
 - tripod level

62. Cracking or breaking from repeated movement or stress over time is a part failure referred to as:
(FOS ID of Parts Failures)
- abrasion
 - cavitation
 - fatigue
 - scuffing
63. ROPS is the acronym for: (IMS #8790)
- random operation procedures system
 - rear operator position signal
 - regular operation procedure signal
 - roll over protective structure
64. A 5W-30 oil has a viscosity of 5 at _____. (IMS #8794C)
- 32 degrees F
 - 10 degrees F
 - 32 degrees F
 - 212 degrees F
65. A _____ is built into most hydraulic systems to prevent damage due to excessive pressure. (IMS #8796)
- directional control valve
 - drum valve
 - relief valve
 - spool valve
66. Which tools should be used to remove the flywheel starter clutch on a 6" diameter flywheel?
(B & S Repair Manual)
- air impact wrench with a deep socket
 - flat pry bar & adjustable wrench
 - flywheel holder tool #19167 and starter clutch wrench #19244
 - torque wrench & spanner wrench
67. Which type of equipment decreases drying time for forage? (IMS #8792A)
- cutter bar
 - mower conditioner
 - multi-disc mower
 - both A and C
68. When changing engine oil, the engine should be at _____ temperature. (Harrell)
- atmosphere
 - low
 - operating
 - room
69. When the ring end gap measures .025", and the rejection specification is .035", piston rings must: (Harrell)
- are suitable for continued use
 - must be aligned on the piston
 - must be replaced
 - should be filed to meet specifications

70. The force exerted at the edge of an engine drive shaft is called _____. (IMS #8203A)
- displacement
 - energy
 - horsepower
 - torque
71. The roof of your implement shed is 40 squares. What does this mean? (IMS #8413)
- the roof decking requires 40 sheets of plywood
 - the roof is a 40' X 40' square
 - the roof is 400 square feet
 - The roof is 4000 square feet
72. Which type of fastener is not generally used with metal components? (IMS #8414)
- cap screw
 - lag screw
 - machine bolt
 - stove bolt
73. A bill of _____ gives the number, sizes, and pieces of materials needed to build an implement shed for your round baler. (IMS #8413)
- fare
 - lading
 - materials
 - sale.
74. Placing your head, arms or upper body through the rear gate, lift cylinders and frame of a round baler creates a _____ hazard. (FBM Safety Mgmt)
- pinch point
 - pull-in point
 - shear point
 - wrap point
75. _____ bolts resemble a threaded rod since they have no head. (IMS #8414)
- Carriage
 - Machine
 - Stove
 - Stud
76. If excessive wear is present in the aluminum valve guides of a Briggs & Stratton engine, the guides should be: (B & S Repair Manual)
- coated with JB Weld
 - knurled
 - reconditioned with a bushing
 - replaced
77. A belt lacer is used to: (FMO Hay & Forage Harvesting)
- adjust belt tension
 - cut belts
 - repair broken belts
 - route belts through bale chamber

78. A typical index of fractional twist drills starts at _____ and runs up to 1/2", in 1/32" graduations. (IMS #8412)
- 1/8"
 - 1/16"
 - 1/32"
 - 1/64"
79. Fuel vaporizes in the small engine carburetor in order to: (IMS #8793B)
- eliminate water vapor in the fuel
 - help each fuel molecule contact enough oxygen to burn completely
 - increase the fuel to air ratio
 - increase the heat contact prior to ignition
80. How fast is a baler traveling in MPH if it travels 470 fpm? (IMS #8792E)
- 3.3
 - 4.3
 - 5.3
 - 6.3
81. Gears are used to transmit power in various types of machinery. Which type of gear is not commonly used? (Harrell)
- helical
 - herringbone
 - rotary
 - spur
82. Prior to the start of the baling season, the operator should perform all of these pre-operational checks except: (IMS #8792)
- check the air in the tires
 - check the belts & chains for wear
 - remove safety shields for easier access
 - remove all oil from chains
83. The number one enemy of a round baler's hydraulic system is: (IMS #8796)
- dirt, heat & foreign matter
 - improper positioning
 - over-heating
 - over-loading
84. Advantages of _____ fasteners include design flexibility, corrosion resistance, and weight. (IMS #8414)
- aluminum
 - brass
 - mild steel
 - plastic
85. Self-tapping screws are available with pointed and _____ end. (IMS #8414)
- blunt
 - pilot
 - plain
 - TEK™

86. The most common governor on a Briggs & Stratton horizontal shaft engine is the:
- air-vane governor
 - hydrostatic governor
 - mechanical governor
 - swash plate governor.
87. Hay rakes can be classified as: (IMS #8792A)
- parallel bar rakes
 - wheel rakes
 - both **a** and **b**
 - neither **a** nor **b**
88. When baling hay, the ideal field shape is: (IMS #8221A)
- irregular
 - long & narrow
 - oval
 - square
89. The field capacity of round balers is designated in: (Harrell)
- acres per hour
 - bales per acre
 - tons per acre
 - tons per hour
90. Valve clearance in a small gasoline engine is the gap between the end of the valve stem and the end of the tappet with the valve closed. (Briggs & Stratton repair manual)
- true
 - false
91. Wear in the cylinder bore of a small engine is called: (Harrell)
- distortion
 - out-of-round
 - scoring
 - taper
92. API oil classifications for spark-ignition engines use the letters: (IMS #8794C)
- C
 - CAE
 - S
 - SAE
93. To make bolts and screws complete metal-to-metal fasteners, use _____.
- nuts
 - rivets
 - threads
 - washers
94. When the automatic choke is operating properly on a Briggs & Stratton engine:
- the choke plate will alternately open and close
 - the engine starts with the first pull of the starter rope
 - the engine will have poor fuel economy at idle speed
 - the engine will hunt at idle speed

95. The moisture content of hay to be round-baled should be: (Harrell)
- a. 5 – 10%
 - b. 10 – 15%
 - c. 15 – 20%
 - d. 20 – 25%
96. _____ screws have un-slotted heads. (IMS #8414)
- a. hex
 - b. oval
 - c. pan
 - d. round
97. Classify small gas engines by the normal position of the _____. (IMS #8793B)
- a. crankshaft
 - b. cylinders
 - c. nameplate
 - d. oil pan
98. What is the cubic inch displacement (CID) of a single-cylinder engine with a 4" stroke and a 4" bore? (IMS #8203A)
- a. 8.377
 - b. 16.00
 - c. 50.26
 - d. 60.17
99. At normal operating temperature, the temperature of the engine lubrication system generally ranges: (IMS #8794C)
- a. 150 – 175 degrees F
 - b. 175 – 200 degrees F
 - c. 200 – 225 degrees F
 - d. 225 – 250 degrees F
100. The horsepower formula is $W \text{ (lbs)} \times D \text{ (ft)} \times T \text{ (sec)} / \text{_____}$. (IMS #8792E)
- a. 5
 - b. 55
 - c. 550
 - d. 5550