

Area 10 Agricultural Mechanics Career Development Event Written Exam

April 11, 2012

Superintendent – Mr. Jerome Tymrak

Theme for 2012 - Materials Handling

Instructions: The written exam portion of this Agricultural Mechanics CDE consists of 100 multiple-choice questions, each worth one point. You have 60 minutes to complete this portion. Make sure you are answering the questions in the proper place on the scantron and marking completely. Please erase clearly, don't tear the scantron sheet, or write on the exam. Thank you & good luck!

1. There are _____ in one acre.
 - a. 4400 square yards
 - b. 5280 square feet
 - c. 43560 square feet
 - d. 45360 square yards

2. There are several advantages to using electric motors for materials handling; the service requirement for using & maintaining properly-selected electric motors is _____.
 - a. a major consideration
 - b. not an issue
 - c. a minor consideration
 - d. none of the above

3. When making power consumption calculations, fractional-horsepower electric motors are considered to have a power factor of _____.
 - a. 1
 - b. 1.2
 - c. 15
 - d. 746

4. Dust accumulations on electric motors can act as _____.
 - a. insulation
 - b. lubrication
 - c. a shield from inclement weather
 - d. an extra coat of paint

5. Remove excessive amounts of oil from electric motors by using _____.
 - a. a brush and non-flammable solvent SAE
 - b. a high-speed fan
 - c. oil-absorbing granules

6. The bolt with the highest SAE classification is:
 - a. Grade 0
 - b. Grade #1
 - c. Grade XT5
 - d. Grade 8

7. When moving a grain cart along a public road, you must use:
 - a. any & all required warning devices
 - b. an approved "SMV" emblem, properly attached
 - c. warning lights
 - d. all of the above.

8. Recommended servicing of a grain cart includes:
- pre-season inspections
 - preventive maintenance during the harvest season
 - regular maintenance & repair at the end of the harvest season
 - all of the above
9. Auger capacity (output) can be measured by all indicators below except _____.
- acres per hour / hectares per hour
 - hundredweight per hour / quintals per hour
 - tons per hour / metric tons per hour
10. Piston seals on hydraulic cylinders on grain carts are usually:
- compression seals
 - diaphragm seals
 - O-ring & backup seals
 - Radial lip seals
11. Safety-alert symbols and key signal words are used on grain carts to identify unsafe areas. Which signal word identifies general safety information and instructions?
- Caution!
 - Danger!
 - Warning!
 - Watch out!
12. Using the formula $MPH = (\text{distance traveled in feet}) \div (\text{travel time in seconds}) \div \text{constant}$, the ground speed of a grain cart towed 125 feet in 27 seconds is:
- 2.76 mph
 - 2.91 mph
 - 3.00 mph
 - 3.15 mph
13. There are _____ linear feet on one mile.
- 5082
 - 5280
 - 5333
 - 5820
14. Electric motors use pulley size to increase or decrease machine speed. The correct formula for determining pulley size and / or speed is $RPM \text{ of Motor} \times \text{Diameter of Motor Pulley} = RPM \text{ of Machine} \times \text{Diameter of Machine Pulley}$.
- True
 - False
 - Incomplete formula – more information needed
15. When replacing a gasoline engine with an electric motor, the electric motor should be approximately _____ the Hp rating of the gasoline engine.
- 1/3
 - 1/2
 - 2/3
 - 3/4

16. Selecting the proper motor enclosure for materials handling applications is important. Common enclosures include explosion-proof (EP), totally enclosed non-ventilated (TENV), and _____.
a. Totally enclosed air over (TEAO)
b. Wind resistant (WR)
c. Closed Drip-proof (CDP)
d. All of the above
17. Two speeds are generally found on PTO shafts. Tractors manufactured in 1960 or later have PTOs that operate at either 540 or _____ rpm.
a. 600
b. 800
c. 1000
d. 1200
18. Electric motors do NOT have:
a. bearings
b. bushings
c. valves
d. commutators
19. Safety alert symbols and signal words are used on round balers to identify hazards. Which signal word identifies the most dangerous condition?
a. Careful
b. Caution
c. Danger
d. Warning
20. Admixtures are materials other than cement, water, and aggregates that give desired qualities to concrete. A *pozzolan* is an admixture that _____.
a. retains air within the concrete mixture
b. controls heat and expansion during hydration & curing
c. compensates for aggregate size
d. is used with tile grout in installations in and around water features
21. Clean, fresh water that is free from _____ should be used in mixing concrete.
a. iron
b. impurities
c. salt
d. gypsum
22. The repair manual specifications call for 84 inch-pounds of torque on the housing bolts of your electric motor; your torque wrench reads in foot-pounds. Which setting would you use?
a. 7.0 ft-lbs
b. 8.4 ft-lbs
c. 10.8 ft-lbs
d. none of the above
23. The component that is used to attach a motor shaft to another machine is a:
a. camshaft
b. coupling
c. jackshaft
d. commutator

24. A _____ is a precision instrument used to check the internal diameter of bearings and bushings.
- cylinder gauge
 - outside caliper
 - outside micrometer
 - thickness gauge
25. All except _____ are advantages of high-quality concrete.
- fireproof
 - limits corrosion & rust formation
 - low maintenance
 - watertight
26. The power factor for a three-phase motor is _____.
- 0.8
 - 1.0
 - 1.2
 - 3.0
27. You are interested in purchasing a 2003 Brent 976 grain cart. The asking price is \$29,500 and 6% simple interest, dealer financed for 7 years. The annual payment is approximately _____.
- \$4243.36
 - \$4345.58
 - \$4467.14
 - \$4589.80
28. When using Fuller's Rule to estimate concrete ingredients, the middle number in the ratio, such as $2 \frac{1}{4}$ in $1 - 2 \frac{1}{4} - 3$, is the amount of _____ needed to produce 27 volumes of concrete.
- Portland cement
 - sand
 - gravel
 - water
29. Placing your hands, arms, or fingers near the intake of a grain auger creates a _____ hazard. To reduce this hazard, always leave the shields in place.
- pinch point
 - pull-in point
 - shear point
 - wrap point
30. One of the most preventable causes of electric motor failure is _____.
- overload
 - sunstroke
 - damage during shipping
 - foreign manufacture
31. Several maintenance issues can cause motor failure in materials handling operations; those issues include factors such as overload, vibration, misalignment, and _____.
- friction
 - proper lubrication
 - new bearings
 - newly-installed belts or chains

32. If a grain auger is not picking up the grain effectively, the problem might be caused by:
- guards not in place
 - auger speed too slow
 - foreign objects caught in guard
 - all of the above
33. Types of electric motor protection suitable for materials handling applications include cartridge fuses, circuit breakers, solenoid switches, and _____.
- digital reset fuses
 - manual reset buttons
 - vee-belt clutches
 - wind resistors
34. You need to move 2000 bushels of oats into a bin, using an auger rated at 500 bushels/hour with a $\frac{1}{4}$ hp 300-watt rated motor. At 0.08 cents per KWH, this will cost _____.
- 1.00
 - 0.10
 - 10.00
 - cannot determine from information provided
35. Common methods for drying electric motors include using forced air, portable heaters, and _____.
- intermittent pulses of high voltage
 - intermittent periods of reversed polarity
 - resistance coils
 - oil absorbent materials
36. A typical speed in RPM for electric motors is _____.
- 1025
 - 1750
 - 1800
 - 1675
37. The most common US grain crops, based on acreage, are _____.
- corn & soybeans
 - wheat & cotton
 - grain sorghum & hay
 - hay & corn
38. Three-phase motors, used for high-horsepower applications and long operating periods at sustained speeds, commonly utilize voltages such as 208, 230 and _____.
- 115
 - 130
 - 260
 - 480
39. Electric motors commonly used for materials handling are capacitor-start, universal, three-phase, and _____.
- split-phase
 - shaded-pole
 - permanent split-capacitor
 - alternating-pole

40. A disadvantage of a belt drive on an electric motor is _____.
- Belts require no lubrication
 - Can be used to change speeds
 - Can be used for high speeds
 - Slippage can be a factor
41. A motor enclosure appropriate for use in grain processing & storage would be _____.
- TEAO
 - ODP
 - ASOP
 - TUAN
42. Service Factor (S.F.) is the amount of overload that the motor can tolerate on a continuous basis at rated voltage and frequency. A 1.0 service factor indicates that no overload is tolerated for extended periods. You plan to use a 0.5 Hp electric motor to move 2000 bu. of wheat into a storage bin. The motor has a service factor of 1.2, and an output of 550 watts. Is the motor capable of performing this task, and what HP output will the motor produce? _____
- yes, 0.6
 - no, 0.6
 - yes, 0.7
 - no, 0.7
43. Direct drive couplings for electric motors include cushion-flange, flexible-hose, and _____.
- water hose couplings
 - reverse-spin couplings
 - direct flange couplings
 - thermo couplings
44. Use a 1/3 Hp electric motor operating at 800 rpm with a 3-inch pulley; to install a pulley to turn an auger at 350 rpm, the correct size pulley needed on the auger is _____.
- 4"
 - 5"
 - 6"
 - 7"
45. Emphasis areas for machinery guard maintenance do not include _____.
- Checking the condition of the guards
 - Checking the tire pressure
 - Aligning or replacing the guards
 - Adjusting the guard clearance
46. Overload protection may be provided by _____.
- proper fusing of the circuit
 - built-in motor protection
 - manual reset devices
 - all of the above
47. Common concrete products include pre-cast, ready-mix, and _____.
- pre-mixed
 - pre-tinted
 - highway-ready
 - masonry

48. Typical concrete aggregates are crushed stone, gravel and _____.
a. gin trash
b. reinforcing bars
c. tire casings
d. sand
49. The rules for producing quality concrete include using proper ingredients, correct measuring and proportioning, and _____.
a. using ingredients on hand
b. using approximations
c. mixing on the ground
d. properly finishing & curing
50. The weight of a cubic foot of finished concrete is approximately _____ lbs.
a. 140 - 150
b. 150 - 160
c. 160 - 170
d. 170 - 180
51. You stand to inherit an older grain cart 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 harvest season in repairs & maintenance. You also estimate that you gain a comparative advantage of \$5 per load by incorporating the cart into your operation. How many loads of grain must you haul in three years to cover the cost of the cart, plus repair and maintenance costs?
a. 144
b. 444
c. 744
d. 1044
52. The factor with the least effect on the quality of finished concrete is _____.
a. brand of cement
b. size of aggregate
c. skill of finish workers
d. placement of reinforcement
53. Safety clothing for placing, finishing, & curing concrete includes baggy clothes, rubber boots, eye protection, and _____.
a. polyester clothes
b. rubber pants
c. gloves
d. sunscreen
54. Using the formula $MPH = (\text{distance traveled in feet}) \div (\text{travel time in seconds}) \div 1.466$, the ground speed of a grain cart that travels 135 feet in 17 seconds is _____ mph.
a. 5.006
b. 5.155
c. 5.416
d. 5.765

55. A section of land contains:
- 160 acres
 - 640 acres
 - 1000 acres
 - 5280 acres
56. On a #92902 Eastingbarn motor nameplate, the letters BRG SLV probably indicates that _____.
- single-lead variable brown w/green wiring
 - sleeve bearings
 - standard left version brown w/green wiring
 - type of motor starter windings
57. A fractional horsepower (FHP) motor is one that _____.
- is available in fractions of 1 HP such as 1.25 HP, 1.5 HP, 2.25 HP, etc.
 - is less than 1 HP
 - can only produce 1 HP of work for short periods of time
 - none of the above
58. The process of performing scheduled routine services is called _____.
- pre-operational checks
 - using a service work order
 - preventive maintenance
 - tune-up
59. Properly-serviced electric motors operate _____.
- safely
 - efficiently
 - neither A nor B
 - both A and B
60. The standard power factor for single-phase motors is _____.
- 0.8
 - 1.0
 - 1.2
 - 1.6
61. A valuable tool for troubleshooting electric motors is the _____.
- on-off switch
 - electrician's screwdriver
 - digital multimeter
 - centripetal planometer
62. Breaking from repeated movement or stress over time is known as _____ failure.
- abrasion
 - cavitation
 - fatigue
 - scuffing

63. Portland cement is manufactured from all except _____.
a. calcium compounds
b. iron oxide
c. alumina
d. galena
64. Sources of cement ingredients include iron ore, fly ash, and _____.
a. aluminum ore
b. discarded tires
c. wood ash
d. sea water
65. Some type of _____ is built into many electric motors to prevent damage.
a. directional control
b. overcurrent protection
c. relief winding
d. vibration-proof mounting
66. The tool generally used to loosen/tighten a vee pulley on a shaft is a/an _____.
a. pulley wrench
b. church key
c. hex key
d. shaft spanner
67. Using a _____ improves concrete quality but causes increased pressure on concrete forms.
a. concrete cutter
b. concrete vibrator
c. aggregate deflector
d. both A and C
68. When placing concrete, the ideal temperature range is _____.
a. $40^{\circ} - 100^{\circ}$ F
b. $32^{\circ} - 80^{\circ}$ F
c. the ambient air temperature
d. $50^{\circ} - 70^{\circ}$ F
69. Calculate machine pulley size when using a jackshaft arrangement and the following specifications: motor speed 1750 rpm, machine speed 60 rpm, motor pulley 2", jackshaft pulleys 12" and 2", machine pulley is _____.
a. 4"
b. 6"
c. 8"
d. 10"
70. The force exerted at the edge of a motor drive shaft is called _____.
a. displacement
b. energy
c. horsepower
d. torque

71. The foundation of a commodity storage bin requires 10 yards of concrete, which means _____.
a. the foundation requires 270 cubic feet of concrete
b. the foundation requires 90 cubic feet of concrete
c. the foundation is 100 square feet
d. the foundation is 1000 square feet
72. V-pulleys are commonly used with electric motors; _____ is not a common type of v-pulley.
a. standard
b. lag pulley
c. v-step
d. adjustable
73. A bill of _____ to provide electric service for a portable auger describes the number, sizes, and kinds of materials needed.
a. fare
b. lading
c. materials
d. sale
74. Placing your arms through the feed chute of a grain cart creates a _____ hazard.
a. pinch point
b. pull-in point
c. shear point
d. wrap point
75. Using the concrete materials-estimating formula called Fuller's Rule, mixing 42 volumes of cement and aggregates yields _____ volume/volumes of concrete.
a. 1
b. 14
c. 27
d. 2 1/4
76. If excessive wear is present in the bushings of an electric motor, the bushings can be _____.
a. coated with JB Weld
b. knurled
c. reconditioned
d. replaced
77. The three common sizes of v-belts for agricultural applications are FHP, A-section, and _____.
a. v-section
b. b-section
c. cross-section
d. multi-v section
78. A _____ is not a part of a standard concrete form.
a. brace
b. gunwale
c. tie
d. wale

79. The _____ reaction generates heat while combining the concrete components.
- cation
 - disambiguation
 - hydration
 - polarization
80. A grain cart towed at a rate of 470 fpm is traveling _____ MPH.
- 3.3
 - 4.3
 - 5.3
 - 6.3
81. Three common types of pulley & belt drives are v-belt, multi-v-belt, and _____.
- curved
 - extruded
 - flat
 - spur
82. Prior to the start of the harvest season, perform all of these pre-operational checks except ____.
- check the air in the tires
 - check the belts & chains for wear
 - remove safety shields for easier access
 - remove all oil from chains
83. Auger pulley speed = _____ when motor speed = 900 rpm, motor pulley = 6" & auger pulley = 15".
- 450
 - 360
 - 330
 - 60
84. Advantages of _____ fasteners include design flexibility and corrosion resistance.
- aluminum
 - brass
 - mild steel
 - plastic
85. Self-tapping screws are available with pointed and _____ end.
- blunt
 - pilot
 - plain
 - TEK™
86. Common on/off switches for electric motors are pushbuttons, toggles, and _____.
- turbines
 - hydrostatics
 - knife blades
 - SPSTs

87. Motor types for processing applications include split-phase, capacitor-start, and _____.
a. shunt-start
b. permanent split-capacitor
c. open-field
d. reverse-capacitor
88. When moving grain from the combine to storage, the ideal field shape is _____.
a. irregular
b. long & narrow
c. oval
d. square
89. You need to load 2,500,000 bu. of oats into a barge, using an auger rated at 75000 bu/hr with a 1.5 hp 3-phase motor (PF = 0.8). At 0.063 cents per KWH, this will cost _____.
a. 2520.00
b. 3333.00
c. 7500.00
d. 40000.00
90. On a #92902 Eastingbarn motor nameplate, the letters PH 1 indicates that _____.
a. the motor runs on single-phase power
b. the motor is suitable for low-Ph applications
c. the motor will only operate in one mounting position – horizontal
d. the motor will accept a 10% starting overload
91. Use a digital multimeter (DMM) to check the _____ in/of a motor's windings.
a. continuity
b. wiring diameter
c. number of turns
d. taper
92. NEMA specifications have worked to assure that _____.
a. motor replacement is not limited by time frame
b. motor replacement is not limited by brand name
c. nameplate information is relatively uniform
d. all of the above
93. To make bolts and screws complete metal-to-metal fasteners, use _____.
a. nuts
b. rivets
c. threads
d. washers
94. Electric motor overheating may be caused by _____.
a. restricted airflow
b. worn bearings
c. shorted windings
d. all of the above

95. The compressive strength of reinforced concrete is _____ times the compressive strength of unreinforced concrete:
- a. 10
 - b. 15
 - c. 20
 - d. 25
96. _____ screws have un-slotted heads.
- a. hex
 - b. oval
 - c. pan
 - d. round
97. One can determine the suitability of electric motor use based on _____.
- a. shaft direction
 - b. mounting bracket
 - c. nameplate information
 - d. lubrication method
98. The cubic yards of concrete mix needed for a slab, 20' x 40', 4 inches thick is _____.
- a. 11
 - b. 16
 - c. 22
 - d. 26
99. The cubic yards of concrete mix needed for a slab, 100' long x 6" wide X 4" thick is _____.
- a. 7.5
 - b. 20
 - c. 22
 - d. 25
100. The formula for horsepower is $W \text{ (lbs)} \times D \text{ (ft)} \times T \text{ (sec)} / \text{_____}$.
- a. 5
 - b. 55
 - c. 550
 - d. 5550