You will have 60 minutes to complete this examination. Answer the multiple-choice questions by selecting the one best answer for each question and bubbling in the answer on the provided scantron.

SECTION 1: Machinery & Equipment Systems Questions 1-10

1. Cone-shaped large round bales result from which of the following conditions?
   a. Feeding too much hay into one side of the baler
   b. Too much hay going into the middle of the baler
   c. Windrows that are too small
   d. Windrows that are too far apart

2. When purchasing a tractor, the salesperson describes the power as the amount of weight the unit can pull at a given speed. What kind of power is being described by the sales person?
   a. Engine power
   b. Drawbar power
   c. Power takeoff power
   d. Hydraulic power

3. When hay is baled, it should not be higher than __________ moisture. At ________ levels of moisture, bales lose large amounts of dry matter caused by excessive heating and molding
   a. 28 to 32 percent; higher
   b. 12 to 16 percent; lower
   c. 18 to 22 percent; higher
   d. 34 to 40 percent; lower

4. Which of the following types of hay conditioners uses a row of fast spinning tines to condition hay?
   a. Crimper
   b. Crusher
   c. Dehydrator
   d. Impeller
5. Heating occurs to some extent in all forage material unless it contains less than ________ moisture.

   a. 15 percent  
   b. 20 percent  
   c. 25 percent  
   d. 30 percent

6. A diesel engine produces blue-colored exhaust. What is the most likely cause?

   a. Low engine temperature  
   b. Combustion of engine oil  
   c. Restricted air intake  
   d. Turbocharger failure

7. A diesel engine produces white-colored exhaust. What is the most likely cause?

   a. Low engine temperature  
   b. Combustion of engine oil  
   c. Restricted air intake  
   d. Turbocharger failure

8. The average farm tractor will convert about what percentage of PTO (power take-off) power to drawbar power?

   a. 40 percent  
   b. 55 percent  
   c. 86 percent  
   d. 100 percent

9. The theoretical field capacity of a machine such as a disk harrow or chisel plow is a function of what two factors?

   a. Tillage depth and working width  
   b. Travel speed and working width  
   c. Tractor power output and draft load  
   d. Machine rating and velocity
10. The extent of temperature rise and duration of heat production in hay depends on moisture content. A relative humidity of 90 to 100 percent, which favors mold development, can develop in ________ moisture hay that is stored inside.

a. 5 percent
b. 10 percent
c. 15 percent
d. 20 percent

Section 2: Electrical Systems Questions 11 – 20

11. A simple device that opens and closes an electrical unit is called a(an):

a. Volt
b. Discharge
c. Switch
d. Ampere

12. What is the unit of measure of electrical pressure that relates to current flow through a given resistance?

a. Ohmage
b. Amperage
c. Voltage
d. Wattage

13. The unit used for measuring electrical current is called a(an):

a. Electrode
b. Volt
c. Discharge
d. Ampere

14. The material that electricity can travel through easily is called a

a. Electrical field
b. Conductor
c. Element
d. Fixed Resistor
15. _____ Which of the following is the proper name for the electrical conductors that travel from the power company’s transformer to a residence?

a. Service drop  
b. Distribution drop  
c. Meter drop  
d. Transmission drop

16. _____ The continuous load supplied by a circuit should not exceed 80% of the branch circuit rating. After how many hours of continuous operation is a load considered to be a continuous load?

a. One-half hour  
b. One hour  
c. Two hours  
d. Three hours

17. _____ A circuit is a path taken by a current. A path with no breaks is called a

a. Complete circuit  
b. Closed circuit  
c. Current circuit  
d. Grounded circuit

18. _____ A GFCI is required in all but one of these locations:

a. Outlets 1-2 feet off the floor in a garage  
b. **Outlets on the ceiling in a garage**  
c. Near the kitchen sink  
d. Near the bathroom sink

19. _____ If there is a break in the path the current follows, the circuit is incomplete. A break in the path is called an

a. Isolated circuit  
b. Full circuit  
c. Incomplete circuit  
d. Open circuit
20. _____ The smallest gage of copper wire the National Electrical Code allows for house wiring is:
   a. #4  
   b. #12  
   c. #6  
   d. #14  

Section 3: Energy Systems Questions 21 – 30

21. _____ The bottom ring on the piston is called the:
   a. Keystone ring  
   b. Compression ring  
   c. Oil ring  
   d. Centering ring  

22. _____ In small diesel engines ____________ is taken in during the intake stroke.
   a. Air only  
   b. Fuel only  
   c. Air and fuel  
   d. Fuel and water  

23. _____ How many revolutions of the crank shaft are in a complete cycle for a 4-stroke-cycle engine?
   a. 1  
   b. 2  
   c. 3  
   d. 4  

24. _____ When the piston of the four stroke small engine reaches the bottom of the cylinder on the intake stroke it starts upward on what stroke?
   a. Exhaust  
   b. Combustion  
   c. Compression  
   d. Power
25. _____ How many revolutions of the crank shaft are in a complete cycle for a 2-stroke-cycle engine?
   a. 1
   b. 2
   c. 3
   d. 4

26. _____ In the electronic ignition the spark originates from the:
   a. Points
   b. Battery
   c. Condenser
   d. Flywheel magnets

27. _____ Three key differences between the diesel and the gasoline 4-stroke-cycle engines are: Diesel is heavier construction, Diesel has a higher compression ratio, and _______
   a. Diesel always uses a carburetor
   b. Diesel combustion occurs because of intense heat and pressure added to the fuel and air
   c. Gasoline combustion requires a fuel injector to create the spark
   d. Diesel engines have oversized spark plugs

28. _____ Modern small engines use a solid-state ignition system to open and close the primary circuit. What part of the small engine ignition system opened and closed the primary circuit prior to the solid-state system?
   a. Transistors
   b. Breaker Points
   c. Integrated chips
   d. Coil

29. _____ What is the part of the coil that is made of several thousand turns of fine gage wire?
   a. The secondary circuit
   b. The main circuit
   c. The primary circuit
   d. The complete circuit
30. _____ The intake valve of a 4-stroke single-cylinder small engine is opened and closed by the action of what component?

a. Piston  
b. Throttle  
c. Wrist pin  
d. Camshaft

Section 4: Structural Systems Questions 31 – 40

31. _____ While flame cutting, the preheat flames (with the cutting jets open) should be?

a. Carborizing  
b. Oxidizing  
c. Neutral  
d. Reducing

32. _____ What is the maximum hose pressure in pounds per square inch (psi) for acetylene fuel gas used in oxyacetylene cutting equipment?

a. 5 psi  
b. 15 psi  
c. 45 psi  
d. 90 psi

33. _____ What is the term for the width of the cut produced by any cutting process?

a. Dragline  
b. Scarf  
c. Kerf  
d. Slag

34. _____ What is the recommended eye protection shade number for a welding helmet lens used when welding with 1/8 inch electrodes?

a. No. 4 lens shade  
b. No. 6 lens shade  
c. No. 8 lens shade  
d. No. 10 lens shade
35. ______ Which oxyacetylene flame has an excess of fuel?
   a. Oxidizing
   b. Carburizing
   c. Neutral
   d. None of the above

36. ______ Vaporized metals such as zinc, cadmium, lead, chromium and beryllium
   a. Are classified as hazardous
   b. Are explosive
   c. Are highly flammable
   d. May cause slag inclusions

37. ______ What is the length of the most commonly used electrode for the process of shielded metal arc welding?
   a. 8 inches
   b. 10 inches
   c. 14 inches
   d. 18 inches

38. ______ Ductility is the ability of a metal to do what before it breaks?
   a. Resist penetration
   b. Return to its original shape after stretching
   c. Elongate
   d. Harden

39. ______ What welding agency or entity does the acronym AWS identify?
   a. Alternative Welding System
   b. Associated Welding Stores
   c. Arc Welding System
   d. American Welding Society
40. _____ Federal regulation requires that hazardous information about a product be provided to all users of that product. The form used to provide this information is called a(n)

a. Information Form (IF)
b. Hazardous Information Sheet (HIS)
c. Occupational Safety and Hazard Form (OSHF)
d. Material Safety Data Sheet (MSDS)

Section 5: Environmental and Natural Resource Systems Questions 41 – 50

41. _____ A manure slurry is more viscous than liquid manure because it contains a higher percentage of what component?

a. Hydrogen  
b. Water  
c. **Solids**  
d. Phosphorus

42. _____ Which of the following types of energy describes electrical, radiant, thermal, motion and sound?

a. **Kinetic**  
b. Potential  
c. Mechanical  
d. Chemical

43. _____ What are two sources of water that increase the amount of liquid manure that must be dealt with at a livestock facility?

a. High humidity and irrigation water  
b. Low humidity and irrigation water  
c. **Wash water and rain water runoff**  
d. Underground water lines and water wells

44. _____ Species that are not native and tend to outcompete native species for resources are described as:

a. **Invasive**  
b. Predatory  
c. Complementary  
d. Indigenous
45. _____ What type of bacteria does not require the presence of free or dissolved oxygen for metabolism?
   
a. Anaerobic  
b. Aerobic 
c. Dehydrated  
d. Consolidated

46. _____ In a farming situation, freshly collected manure was found to be 30 percent solids and 70 percent moisture by weight. The collected manure was stockpiled in a covered structure for several months and during that time 30 percent of the manure's original moisture content evaporated and/or drained away. If 6 tons of the drier manure is applied to crop fields, what approximate weight (in pounds) of the applied manure is actually solid?  
   Note: 1 ton = 2000 pounds
   
a. 1,445 pounds  
b. 4,557 pounds  
c. 7,889 pounds  
d. 10,089 pounds

47. _____ Stress cracks in grain corn kernels can be caused when high temperature grain drying is followed by which process?
   
a. Slow heating of the dried grain  
b. Rapid cooling of the dried grain  
c. Waterification of the dried grain  
d. Rapid heating of the dried grain

48. _____ What method of controlling invasive trees is expensive but allows for selective removal of trees?
   
a. Biological  
b. Chemical  
c. Mechanical  
d. Physical

49. _____ Which of the following are two types of fans that used to force air through grain in a grain bin?
   
a. Centrifugal and axial  
b. Turbine and axial  
c. Tubular and elastic  
d. Static and dialectric
50. _____ Which common range site has coarse textured soil that absorbs water well?

a. Deep Sand
b. Rough Breaks
c. Bottomland
d. Claypan Prairie