E&I MAINTENANCE ENTRY TEST ENABLING OBJECTIVES

SAFETY

Industrial

DESCRIBE hazards and precautions taken to avoid injury in the workplace**.**

Example #1:
All of the following are common PPE used to perform maintenance activities **EXCEPT**:
a. Safety Glasses
a. Gloves
b. Ear Plugs
c. Work Permits

Electrical

DESCRIBE electrical hazards and precautions taken to avoid injury in the workplace**.**

Example #2:
When performing testing of energized electrical equipment rated at 480VAC what type of gloves are required?
a. Low Voltage
b. High Voltage
c. Listed Leather
d. Cotton lined/Temperature rated

ELECTRICAL

DC Theory

Given a formula sheet and schematic drawing, **ANALYZE** the relationships between voltage, resistance, current and power in series, parallel and series-parallel DC circuits.

Example #3:
What are materials that have NO free electrons at room temperature called?
a. Conductors
b. Semiconductors
c. Insulators
d. Resistors

Test Equipment

DESCRIBE the basic functions and requirements for using various electrical test meters.

Example #4:
In a D'Arsonval meter, what is the pointer attached to?
a. Magnet
b. Coil
c. Spring
d. Pivot Bearing

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Batteries

Given basic information about Batteries, **DESCRIBE** the various aspects pertaining to Batteries.

Example #5:
Which of the following is classified as battery ratings?
a. Lead-acid, voltage, resistance.
b. Ampere-hours, nickel-cadmium, alkaline.
c. Internal resistance, voltage, ampere-hours.
d. Weight, connections, type of terminal fittings.

AC Theory

Given a formula sheet and schematic drawing, **ANALYZE** the relationships between frequency, voltage, current, impedance, inductance and power in simple series and parallel circuits.

Example #6:
In an AC circuit with R and L in series which relationship is true?
a. The voltage across the inductor and the current through the inductor are in phase.
b. The voltage across the inductor lags the current through the inductor by 90°..
c. The current through the resistor lags the voltage across the resistor by 180°
d. The voltage across the resistor lags the voltage across the inductor by 90°.

Oscilloscope

EXPLAIN the basic operation and functions of a typical Oscilloscope.

Example #7:
The purpose of the oscilloscope is to provide the user with a graphical representation of:
a. Voltage vs. Time
b. Phase shift vs. Capacitance.
c. Resistance vs Voltage
d. Current vs. Resistance

Electrical Parameters and Relationships

DESCRIBE the following electrical parameters, including the unit of measurement and the relationship to other parameters.

a. Voltage
b. Current
c. Resistance
d. Conductance
e. Power
f. Inductance
g. Capacitance

Example #8:
The power factor of a circuit is equal to:
a. (E) (I) cos θ
b. cos θ
c. (E) (I) sin θ
d. sin θ

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AC, DC Motors and Generator Operations

EXPLAIN the purpose, function, operation, maintenance, and troubleshooting techniques of DC and AC (1ϕ and 3ϕ) motors and generators and their major components.

Example #9:
The pushing and turning force is called_____ and is created by the magnetic field of the pole pieces and the magnetic field of the loop armature.
a. torque
b. motor action
c. generator action
d. armature action

Illumination

DESCRIBE the basic design, wiring and operating characteristics of the following types of lamps:

a. •Incandescent
b. •High Intensity Discharge (HID)
c. •Fluorescent

Example #10:
The two most common types of incandescent lamps are:
a. tungsten filament and tungsten halogen lamps.
b. tungsten filament and cold-cathode lamps.
c. fluorescent tubes and filament bulbs.
d. compact fluorescent bulbs and filament bulbs.

Basic Wiring and Terminations

Given material descriptions, **EXPLAIN** proper mechanical and soldering termination techniques.

Example #11:
The pre-tinning of wire prior to soldering is done to prevent:
a. thermal mass
b. weakening
c. birdcaging.
d. surface area loss.

Basic Print Reading

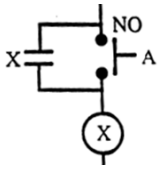
Given a standard electrical symbol, **IDENTIFY** the component that the symbol represents.

Example #12:
The following symbol is an example of a :
a. coil.
b. lamp.
c. temperature switch.
d. pressure switch.

MCCs

ANALYZE electrical prints and drawings to explain the operation of electrical, motor control

Example #13:
In the following diagram, what is another name for the NO Contacts in parallel to the "A" push button?

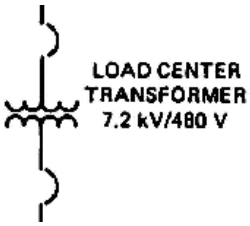


a. X-tra Open
b. Hold Fast.
c. Staging
d. Seal In

Switchgear and Distribution

DESCRIBE area power distribution schemes and **RELATE** wiring requirements to the National Electric Code standards.

Example #14:
In the following diagram, which best describe the Load Center Transformer?

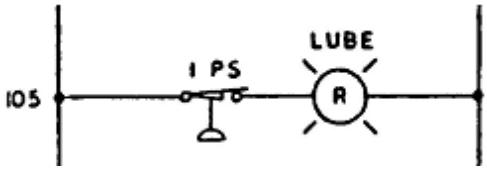


a. Step Up
b. Stationary
c. Dry type tertiary.
d. Step Down

Electrical Troubleshooting

ANALYZE electrical prints and drawings to explain the operation of simple electronic circuits.

Example #15:
In the following diagram, what will cause the lube indicator to turn "off"?



a. No change in the operation.
b. Vacuum on the measured variable.
c. Increase in lube pressure.
d. Decrease in lube pressure.

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INSTRUMENTATION

Pressure

DESCRIBE basic pressure instrumentation theory, components, and functions.

Example #16:
Absolute pressure can best be described as:
a. The minimum blood pressure in the artery
b. The pressure relative to atmospheric pressure
c. The sum of gauge pressure and atmospheric pressure
d. The maximum blood pressure in the artery

Level

DESCRIBE basic level instrumentation theory, components, and functions.

Example #17:
In case of open tanks, i.e. tanks which are open to the atmosphere, only _____ ends of the DP transmitter is need to be connected:
a. Low Pressure
b. Atmospheric Connection
c. High Pressure
d. Absolute Vacuum

Flow

DESCRIBE basic flow instrumentation theory, components, and functions.

Example #18:
Volumetric flow rate is the volume of fluid _____passing a point in a fluid system.
a. under controlled state
b. density
c. per unit time
d. continually

Temperature Measurement

DESCRIBE basic temperature instrumentation theory, components, and functions.

Example #19:
What happens when heat is applied to the joined ends of the wires of a thermocouple?
a. The wires contract.
b. The wires start to rotate.
c. A small voltage is generated.
d. The wires separate. :

Pneumatic and Electronic Transmitters

DESCRIBE basic pneumatic and electronic transmitter theory, components, and functions.

Example #20:
The device that includes a transducer and produces an amplified, standardized instrument signal is called the:
a. filter.
b. transmitter.
c. zero-order-hold .
d. amplifier.

MISCELLANEOUS (FUNDAMENTAL QUESTIONING)

PLC

DESCRIBE the function/operation of typical PLC systems.

Example #21:
Which **BEST** describes a Programmable Logic Controller?
a. A digital computer used for automation of electromechanical processes.
b. A safety interlocking device vital to the performance of machine guarding.
c. Preferred substitute for analog and digital transmitters on radiological equipment only.
d. Series and paralleled relays used to denote changes in process level and flow.

UPS

DESCRIBE the function/operation of typical UPS systems.

Example #22:
Which **BEST** describes an Uninterruptible Power Source (UPS)?
a. A synchronous motor/alternator connected on the main Bus power.
b. Electrical apparatus that provides emergency power to a load when the input power source fails.
c. The utility, or incoming, power supply with an Automated Transfer Switch (ATS).
d. Series and paralleled batteries used to provide control power during outages.

VFD

DESCRIBE the function/operation of typical VFD systems.

Example #23:
What is the purpose of the Rectifier section of the Variable Frequency Drive?
a. Monitors and develops current for the Microprocessor.
b. Filters output DC to a choppy AC.
c. Develops a DC input to AC.
d. Converts AC to DC.

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Alarms/Annunciators (single loop systems)

DESCRIBE the function/operation of typical annunciator systems.

Example #24:
There are basically two types of alarm modules in a typical annunciator system, they are:
a. Relay driven or IC (integrated circuit) driven.
b. First and Flash reset.
c. Alarm and Point Canister.
d. Flasher pulse and static.

ANSWERS TO TEST EXAMPLES

#1. c. Work Permits
#2. a. Low Voltage
#3. c. Insulators
#4. b. Coil
#5. c. Internal resistance, voltage, ampere-hours.
#6. d. The voltage across the resistor lags the voltage across the inductor by 90°.
#7. a. Voltage vs. Time
#8. b. cos θ
#9. a. torque
#10. a. tungsten filament and tungsten halogen lamps.
#11. c. birdcaging
#12. b. lamp
#13. d. Seal-In
#14. d. Step Down
#15. d. Decrease in lube pressure.
#16. c. The sum of gauge pressure and atmospheric pressure
#17. c. High Pressure
#18. c. per unit time
#19. c. A small voltage is generated
#20. b. transmitter
#21. a. A digital computer used for automation of electromechanical processes.
#22. b. Electrical apparatus that provides emergency power to a load when the input power source fails.
#23. d. Converts AC to DC.
#24. a. Relay driven or IC (integrated circuit) driven.