Performance Based Objectives – AC/DC Motors, Drives & Controls

PBO No.	Performance Based Objective
MD-1	Calculate total current, total resistance and individual voltages and currents of series and parallel circuits. Construct, measure and verify calculations related to the following: - Voltage, Current and Resistance - Ohm's Law - Power Calculations - Series and Parallel circuits
MD-2	Demonstrate the proper use of the following tools & test equipment in performing electrical measurements, repairs, and installations. - Hand tools and related safety - Power tools and related safety - Electrical & electronic testers, and meters.
MD-3	Identify power hazards in lab circuits and describe the proper safety precautions related to the following: - Electrical safety practices used in Industry - NEC - PPE - Lockout/Tag-out - Confined spaces
MD-4	Demonstrate the use of the following items to navigate, identify, and describe the function of electrical circuits: - Symbols - Electrical diagrams - Schematics - Line diagrams - Applications
MD-5	With the use of a control diagram, construct and debug circuits using the following items: - Line diagram rules & numbering - Load and control connections - Logic functions (Relay)
MD-6	Match these DC electrical devices: DC Generators, DC Motors, & Solenoids to a list of their characteristics in the areas of: - Magnetism &Electromagnetism principles - Operating Characteristics - Applications - Connections/wiring
MD-7	Construct a DC generator circuit. Predict and verify the output changes as related to speed.
MD-8	Construct a DC Motor control circuit (Relays); demonstrating speed control, starting current control, reversing and braking. Change the configurations (series to shunt to compound) of the DC motor and verify the characteristics of each configuration.

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PBO No.	Performance Based Objective
MD-9	Match these AC electrical devices: AC Generators, AC Motors, Transformers, & Solenoids to a list of their characteristics in the following areas: - Single and Three phase AC applications - Magnetism & Electromagnetic principles - Operating Characteristics - Applications - Connections/wiring - Maintenance & Troubleshooting
MD-10	Construct AC single phase and three phase motor circuits and compare the operating speed and currents to the faceplate information.
MD-11	Predict the direction of rotation of a stepper motor when given a drawing of the motor's windings and the polarity of the applied voltage.
MD-12	Match the following AC and DC motor braking methods to their proper description: - Friction Brakes - Plugging - Electrical Braking - Dynamic Braking
MD-13	Match the following devices used in motor installations to their proper description: - Line Protection - Filtering Devices - Surge protectors - Disconnects - Contactors & relays - Overloads
MD-14	List and interpret motor nameplate data. (Written exercise using motor nameplates)
MD-15	Match the following Power Distribution items to a list of their proper description: - Transformers and sub-stations - Switch boards and Panel boards - Branch circuits - Motor control centers - Feeders and Bus-ways - Grounding - Fuses and circuit breakers
MD-16	Match these motor controls (switches, relays, contactors, starters, & intelligent devices) to a list describing the following items: - Operating characteristics (including manual operation) - Applications - Connections/wiring - Troubleshooting

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PBO No.	Performance Based Objective
MD-26	Match the following reduced-voltage starting circuits to their proper description: - Reduced-voltage starting method comparison - Solid-state switching & starting - DC motor reduced-voltage starting - Reduced-voltage starting for three-phase induction motors - Primary resistor starting - Autotransformer starting - Part-winding starting - Wye-Delta starting - Troubleshooting
MD-27	Match the following motor reversing methods and control schemes to their proper description: - Reverse motors using manual starters - Reverse motors using drum switches - Reverse motors using magnetic motor starters - PLC control - Magnetic reversing starter applications - Wiring methods - Troubleshooting
MD-28	Construct a three phase motor starter control that can reverse the direction of rotation. Document the circuit through the generation of an appropriate diagram. Must apply overloads and conventional start/stop circuitry.
MD-18	Demonstrate Electrostatic Discharge prevention while working with drive components.
MD-19	Demonstrate Motor Drive Pre-Power and Power-On checks.
MD-20	Navigate Motor Drive Control operator interfaces, software, and menus.
MD-21	Demonstrate the Upload & Download procedures of Motor Drive parameters.
MD-22	Monitor and edit drive parameters of a VFD to affect the motor's operation.
MD-23	Write a description of the motor regeneration principle.
MD-24	Describe the relationship between an AC motors amount of slippage and expected current under varying load conditions.
MD-25	Identify & match NEMA classification ratings of motors to name plate information.
MD-29	Match the following Timing and Counting items to their proper description. - Timers - Counters - Wiring - Applications - Troubleshooting
MD-30	Given an output timing diagram, develop a control circuit to achieve the desired output, construct and debug the circuit.

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PBO No.	Performance Based Objective
MD-31	Match the following Sensing devices to a list of their proper descriptions. - Photoelectric (types include retro-reflective, Transmitter/Receiver, etc.) - Ultrasonic - Proximity (including Magnetic and RF) - Safety devices (e.g. light screens, scanners, mats, etc.) - Indicators - Capacitive switches, etc.
MD-32	Given a circuit description containing several differing sensors for inputs and a sequence chart for the outputs, develop a control circuit to achieve the desired output, construct and debug the circuit. Document the circuit through the generation of an appropriate diagram.
MD-34	Using diagnostic LEDs and Fault Codes on a motor drive, select the appropriate corrective action.
MD-35	Program a variable frequency drive to control the speed, acceleration and deceleration of an induction motor. Write a program to start, stop, and reverse the motor.

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