Practice Quiz:

1. T **F** The converter section of a VFD converts the DC voltage to AC voltage.
Explanation: The converter section (sometimes called the rectifier section) of a VFD changes the incoming AC voltage to a DC voltage. The next stage of the VFD is the DC Link, which filters and regulates the DC voltage. The last (final) section of the VFD is the inverter section. This section changes the DC voltage into AC voltage at a varying frequency (and voltage level) to change the speed of the motor connected to the output of the VFD.

2. T **F** The DC bus voltage on a 240VAC, three phase VFD is 240VDC.
Explanation: The DC bus voltage should be the calculated peak voltage of the incoming AC voltage to the VFD. If the unit is a 240V three phase VFD, the 240V is an RMS value. To convert to a peak value, the user must take the RMS times 1.414. So in this case, the bus voltage is 240 * 1.414, which is 339 VDC. The reason for this is that the capacitors in the DC Link section of the VFD charge to a peak voltage.

3. T **F** VFDs are designed to control an induction motor, or a wound rotor motor.
Explanation: VFDs are designed to control an AC induction motor. The other types of three phase motors are wound rotor and synchronous speed. The wound rotor motors are older motors used prior to electronic drives. The rotor has windings brought out through slip rings that would connect to a variable resistor, which varied the rotor current, which varied the torque of the motor. These motor have been replaced by induction motor controlled by VFDs. The synchronous speed motors were used to give a constant speed to AC generators and fluid pumps. Once again, many of these applications have been replaced by induction motors controlled by VFDs.

4. **T** F An AC drive changes the speed of an AC motor by changing the frequency of the voltage going to the motor.
Explanation: An AC drive (VFD) varies the output frequency to vary the speed of an AC induction motor. The output voltage will also change proportional to the frequency.

5. What is the approximate output voltage change if there is a change of 1 hertz on the output of a 460V, three phase VFD?
   a. 2.5 V
   b. 4.2 V
   c. 3.8 V
   d. 7.6 V

Explanation: Realize that the output of a VFD has a Voltage/Frequency ratio. The amount of this voltage to frequency can be calculated by dividing the voltage of the drive or motor (these

should be about the same - A 240VAC three phase motor is controlled by a 240VAC three phase VFD) by the frequency (60 hertze). A 460V divided by 60, is 7.6 V. If a 460V, three phase VFD is outputting 30 hertz to a motor, the voltage should be 228 volts going to the motor (7.6 * 30).

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6. Jj

7. What occurs on a PF525 system, if the Reverse Direction button is pushed while the drive is running (assume the Reverse Direction button is enabled)?

a. The drive faults out
b. The motor decelerates then changes direction and goes up to the set speed
c. The motor continues running until stopped, then goes in the reverse direction when started
d. The motor continues to run and button is disregarded because it is inactive when the drive is running.

Explanation: On the PF525, the motor decelerates based on the method stopping that the drive is programmed for, then it reverses direction and accelerates based on the time set for acceleration until it gets up to the speed set by the potentiometer.

8. **T** F A conveyor type of motor load requires constant torque.
Explanation: A conveyor is a type of load that requires a constant torque. The constant torque is set by the output voltage/frequency ratio. If the VFD is setup for constant torque (a configuration in most drives), the variables will be the speed and horsepower. So a common configuration for a conveyor is constant torque/variable horsepower.

9. **T** F The final stage of circuitry within an AC drive is the inverter section.
Explanation: The inverter is the last stage of the VFD circuitry. The inverter converts the DC bus voltage to AC through pulse width modulation. The width and polarity of the pulses, create current flow that will be similar to an AC sine wave. The frequency of the sine wave is varied, which will change the speed of the motor.

10. T **F** When an AC motor gets up to full speed, at full load, the motor is producing locked-rotor torque.
Explanation: When the AC motor gets up to full speed, at full load, it is producing full-load torque. On the initial start up of an AC motor, locked-rotor current is produced. This will cause a current of 6-8 times full load amps. Breakdown torque is the amount of torque created when a motor experiences extreme mechanical overload and can actually stall.

11. T **F** Most AC drives default to a “Coast to Stop” method of stopping.

Explanation: Most AC drives default to a "ramp to stop" method of stopping. This is simply entering an amount of time to bring the motor to a stop. The parameter for this setting is "Deceleration Time".
Explanation: On most drives, the default method of stopping is "Ramp to Stop". This is due to using a time factor to bring the motor to a stop. If the motor was connected to a centrifugal load (flywheel load), it would take a very long time for it to come to a stop. A flywheel load is one that is circular and has a large diameter. The larger the diameter and thickness of the load, the longer it will take to start and the longer it will take to stop.

12. T **F** A 10 HP, 230V three phase VFD will control a 10HP motor if the drive is powered by three phase or single phase 230V.
Explanation: If a VFD that has the capability of being powered with single phase voltage, the drive will have to be de-rated by 50%. This means that this drive will only control a 5HP motor. Usually the smaller drives are rated that they can be fed with single phase. Larger drives will need a full three phase.

13. **T** F "Inverter Rated" motors should last longer than a standard induction motor if controlled by a VFD.
Explanation: Due to the high speed switching of current on the motor from a VFD, a standard induction motor will eventually burn out. An "Inverter Rated" motor will last longer, since it is built with stronger insulation around the motor windings.