Pretest Module 32 Units 1 & 2

1. What are the three main parts of an adjustable-speed, DC, solid-state drive? DC Motor, Control panel, and Operator control station

2. What type of DC motor is used for a DC adjustable-speed drive? Mostly shunt with small series field and designed to be used with the chopped output of a converter

3. What is the purpose of the control panel for a DC adjustable-speed drive? Convert the supply AC to DC and regulate the output to the DC armature

4. What two values are used to calculate the error signal in the control panel for an adjustable-speed, solid-state controller? Armature voltage and speed potentiometer

5. What are the two regulator circuits in a control panel to protect a DC motor? Speed regulator and current regulator

6. What is the purpose of the “speed reference signal”? Start and stop a load smoothly

7. What is controlled by the “current error signal” in a DC adjustable-speed drive? Triggering of the gates

8. What is housed in the control panel for a DC adjustable-speed drive? (Other than the regulatory circuitry and power converters) Disconnect switches, contactors, overload and overcurrent protection

9. What is typically found in the operator’s control station for a DC adjustable-speed drive? Switches, pushbuttons, pilot lights, and speed potentiometer

10. What are the main considerations when installing a control cabinet for a DC adjustable-speed drive? Area free of vibration and dust, proper ambient temperature, full accessibility, and proper air flow

11. What precautions should be taken with control and signal cables for a DC adjustable-speed drive? Shielded and twisted

12. How should cable shield screens be grounded? One point (Cabinet)

   Task 2

13. What is the operating principle of a diode? Allows current flow in one direction and blocks the other
14. How is the demand on filter circuits minimized for a DC adjustable-speed drive? Higher ripple frequency

15. What two circumstances will cause an SCR to conduct current in a forward direction? Gate signal or forward breakeover voltage

16. How is a conducting SCR turned off? Commutating

17. What are the advantages of three-phase input supply for a DC adjustable-speed drive? Higher ripple frequency

18. What is the purpose of the free-wheeling diode in a single-phase, full-wave, semi-converter? Discharge inductive energy of motor armature

19. What change must be made in semi-converters to allow full control of the output voltage from 0 Volts to a maximum? Replace diodes with SCR

20. How are the firing angles of SCRs controlled? Pulses

21. What is the purpose of a pulse transformer? Generate pulses for gates

   Task 3

22. What is a stabilized DC shunt motor? Compound motor with light series winding

23. How are DC motors rated for compatibility to a power converter? Power Code

24. What is the difference between a semi-converter and a full converter? Semi has 3 SCRs and 3 diodes, full has 6 SCRs

25. How are the terminals for the series winding, shunt winding, armature and overload labeled on a motor for a DC adjustable-speed drive? S1 & S2, F1 & F2, A1 & A2, and P1 & P2

26. Describe the two types of braking for a motor used with a DC adjustable-speed drive. Dynamic and Regenerative

27. How are DC motors typically reversed? Reverse armature connections

28. What is the purpose of an anti-plugging relay in a DC adjustable-speed drive? Prevent reversing the motor during braking

29. What types of protection are required for a DC motor operated by a DC adjustable-speed drive? Overcurrent and current limit, Overload, overvoltage, field loss, over temperature, blower if below 60% speed
30. What are the three basic steps to starting and adjusting a motor connected to a DC adjustable-speed drive? Do the pre-power checks, then the control circuit checks, then uncouple the motor if possible and set controls to minimum.

31. What type of feedback is required when a tachometer is used for feedback signals for a DC adjustable-speed drive? Negative.

32. What devices are required for troubleshooting a DC motor and a DC adjustable-speed drive? Oscilloscope, Multimeter, DC clamp-on ammeter, tachometer.

Unit 2

1. What are the four main parts of a variable-frequency AC drive? DC power, Filter, AC section, and Control section.

2. How is the DC output voltage adjusted in the DC power section of a variable-frequency AC drive? Rectifiers and SCRs.

3. What are the two types of filters used in the filter section of a variable-frequency AC drive? Capacitor and inductor.

4. What two properties of the power are regulated in the inverter of the AC power section to supply the proper frequency, voltage and phase sequence output? Switching action and polarity of the DC.

5. What does the speed of an AC motor depend on? Synchronous speed of the rotating field of the stator.

6. How is the torque to speed curve maintained in an AC motor with a variable-frequency AC drive? Varying the voltage and frequency proportionally.

7. What are the three basic inverter schemes for controlling voltage and current as the frequency of the motor changes? Variable Voltage Inversion, Current Source Inversion, and Pulse Width Modulation.

8. What is the minimum and maximum ambient temperature for installing a control panel? 10-40 degrees C.

9. How is interference from the inverter minimized? Input filters and shielded input cables.

10. What precautions should be taken before working in a control panel? Lock out the power source and discharge the capacitors.

11. Why is a megger not recommended for testing inside a control panel for a variable-frequency AC drive? Voltage too high and will damage components.
12. What is the most common problem with a variable-frequency AC drive that is not working? Blown fuse

13. How is the shaft speed of a motor measured? Tachometer

14. What is the most likely cause of the motor acceleration or deceleration being rough? Too short acceleration or deceleration time

Task 2

15. What type of wave is produced by a simple mechanical switch inverter? Square

16. What device acts like the switch (previous question) in a single-phase bridge rectifier? SCR or transistor

17. How is reactive energy from an inductive load dissipated in a bridge rectifier? Diodes across the switching devices

18. What is a six step inverter? Three-phase full-wave

19. What factor controls the frequency output from the inverter section in a variable-frequency AC drive control using VVI? Speed reference signal

20. Why are “CSI” drives more reliable than “VVI” drives? Current limiting ability

21. Which type of drive system overcomes the disadvantages of “CSI” and “VVI”? Pulse Width Modulation

22. How is the amplitude of inverter output voltage controlled using a “PWM” drive system? Varying the ratio of on and off time for pulses

23. What does the torque of a typical AC motor depend on? Voltage and frequency

24. How is the speed of an AC motor typically affected from no-load to full-load? Very small

25. What are three methods of keeping motor from overheating when it is operated at full load and reduced speed? Larger motor, external cooling, and reduced torque demand and de-rate the motor

26. What ratio has to be maintained to have constant stator flux in an AC motor operated at different speeds? Voltage/Frequency

27. What is the result of operating an AC motor above rated speed when the voltage cannot be increased? Torque decreases
28. Describe dynamic and regenerative braking. Dynamic- DC is applied to the stator to slow and stop the motor. Regenerative- when running above rated speed it turns into a generator.

29. How do you reverse a three-phase AC motor simply with a variable-frequency drive? Change the inverter switching sequence electronically.