Final exam spring 2006

1) Show the (a) and (b) connections to the final control relay on the left such that an active low pressure sense high limit sensor and an active low temperature sense low limit sensor will turn on motor # 2 when both sensors are in alarm. Other wise motor # 1 will be active. 

(Magnetic field will pull center connector away from motor 2 and toward motor 1.)

2) I know the difference between a current limiting and pull up resistor. 

Yes ___ or No ____

3) I have reviewed and know the correct answers for all of the test 4 questions that related to item (16) on this test. 

Yes ____ or No ____

4) If there is 10 volt signal on the input of the circuit in item (26), I know which diodes are reverse or forward biased. 

Yes ____ or No ____

5) I can read and understand the program that is described in items (19),(21) and (22).Yes___ or No____

6) Show the wire connections of the temperature sense low limit sensor shown below to an appropriate address on the PLC input module also shown below. Make this sensor an active low sensor.

7) Show the wire connections to an address of the PLC for the other sensor shown above. Make that sensor an active high sensor.

8) Show the wire connections to an address of the PLC for the motor shown above. Make that motor an active low motor.

9) Item (8) on page 2 is the symbol for a normally open pushbutton. 

Yes___ or No ____

10) Item (7) on page 2 is the symbol for a normally closed pushbutton. 

Yes___ or No ____
11) Item (2) is an npn transistor. Yes ___ No ___
12) If the base on the grounded transistor in item (4) is also at zero volts, the motor in the circuit will be ON. Yes ___ No ___
13) Item (5) is most likely a counter. Yes ___ No ___
14) I know the use and difference among the op amp items on page 4 of this test. Yes ___ No ___
15) Item (6) is a NAND device. Yes ___ No ___
16) If (a) and (b) of item (6) are at logic "0" what is the logic signal at (c) ___
17) The contacts inside the sensor shown as item (9) are N.O. Yes ___ No ___
18) If Q1 in item (16) is saturated, Q2 is OFF. Yes ___ No ___
19) If Q2 in item (16) is saturated, Q1 is OFF. Yes ___ No ___
20) If Q2 in item (16) is ON, Q1 is OFF. Yes ___ No ___
21) If both status inputs in item (11) are passive, one LED is glowing. Yes ___ No ___
22) If LED 2L3 is light, the temperature sensor in item (11) is in alarm. Yes ___ No ___
23) I know the correct answers to test 4 questions about (13),(14),(15) and (17). Yes ___ No ___.
24) LED's do not have to have a current that exceeds 16 milliamps. Calculate the resistor value for the TTL circuit in item (3) that meets this design constraint and when there is no appreciable voltage drop across the LED?
25) If V1 in item (10) is 100 volts, the resistance values for R2 and R3 equal 500 ohms, and the resistance of R1 is very, very large compared to R2 and R3, what is the voltage value at point (b).
26) If active low temperature sense low alarm sensor and an active low pressure sense low alarm Both go into alarm, a motor must stop running. Draw a function diagram for this idea. Include a start pushbutton and show the proper connection of the motor to a N.C. relay.
(18)

(19)

(20)

(21)

(22)

(23)

(24)

(25)

(26)

(27)

(28)

(29)
30) Examine item (20) and fill in the rest of the I/O map provided below.

<table>
<thead>
<tr>
<th>Field Device</th>
<th>Harness I.D.</th>
<th>I/O module address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26-763</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26-766</td>
<td></td>
</tr>
<tr>
<td></td>
<td>42-301</td>
<td></td>
</tr>
<tr>
<td></td>
<td>42-303</td>
<td></td>
</tr>
<tr>
<td>Motor starter 1</td>
<td></td>
<td></td>
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</tbody>
</table>

27) Using the information you recorded in question 30, write a ladder program that will allow the motor starter to start the motor when both sensors are passive. Include the Start and Stop push buttons in your program. Make sure you include the appropriate addresses (as indicated from your I/O map in question 30) for each program icon you use.

28) Examine item (26), if the $V_{in}$ signal is 4 volt which diode is forward biased? ________

29) You wish to use two temperature sensors, TS #1 and TS#2 that provide a variable voltage output signal that is proportional to the temperature they measure. Design and then draw the function diagram of a control circuit that will provide as an output the average voltage value from these two independent temperature sensors.