COMPREHENSIVE EXAMINATION (Closed Book)

Course No	: INSTR C312
Course Title	: Industrial Instrumentation & Control
Date	: 01.06.09
Time	: 3 Hours Max.Marks : 40 (40 %)

NOTE: 1. ANSWER ALL THE QUESTIONS IN SEQUENTIAL ORDER.

2. ALL THE SYMBOLS AND WORDS CARRY THEIR USUAL MEANINGS, UNLESS OTHERWISE STATED.

(8 x 5 = 40)

1. Design a PLC program for a typical Input / Output connection for the following counter specifications.

   a. Counter counts the no of times when a push button is closed.

   b. Decrements the accumulated value of counter each time when a second push button is closed.

   c. Turn on light anytime when the accumulated value of the counter is less than 20.

   d. Turn on the second light when the accumulated value of the counter is equal to or greater than equal to 20.

   e. Reset the counter to zero when a selector switch is closed.   [5 M]

2. An integral controller will have a measurement range of 0.4V to 2.0V and an output range of 0 to 6.8V.Design an op amp integral controller to implement a gain of K_I = 4% /(%-min). Specify the values of G_I, R, and C.

[5 M]

3. a. Explain the different types of tuning methods with respect to errors for conventional controllers.   [3 M]

   b. How tuning is done in frequency response method?   [2 M]

4. a Define Control valve.

   b. What are the basic elements of the control valve?

   c. What are the classifications of control valve?

   d. What are the selection criteria for control valve?

   [1+1+2+1 M]

5. a. What is meant by inferential control? Explain it.

   b. Mention any four major differences between FFC and FBC.   [3 +2 M]

6. Using Hebb rule, train the EX OR gate to the neural network. Suggest the different methods and give your comments. The order is.

X1	X2
1	1
0	1
1	0
0	0

   [5 M]

7. Find Maximum - Minimum composition, Maximum - Product Composition & Relational Joint for A & B.

$$A = \begin{bmatrix} 0.7 & 0.5 & 0.0 \\ 1.0 & 0.0 & 0.0 \\ 0.0 & 1.0 & 0.0 \\ 0.0 & 1.0 & 0.9 \end{bmatrix} \quad B = \begin{bmatrix} 0.6 & 0.8 \\ 0.0 & 1.0 \\ 0.0 & 0.9 \end{bmatrix}$$

   [5 M]

8. a. What are the difference between supervisory computer control and DDC?

   b. What are the program control Instructions in PLC?

   c. Which control is called as Preact control?   [2+2+1 M]

ALL THE BEST

Course No : INSTR C312

Course Title : INDUSTRIAL INSTRUMENTATION & CONTROL

Date : 12.04.09   Time: 50Minutes   M.M = 20 (20%)

NOTE: 1. All the symbols and words carry their usual meanings, unless otherwise stated.

2. Answer all the questions.

3. Only text book is allowed. Class notes, photocopy of class notes, photocopy of text books are not allowed

PART A   [20*0.5 =10M]

I.

1...................... valve is used for flow of chemical fluids in the process.

2.......................... valve is used for flow of corrosive fluids in the process.

3. Sluggish flow is not possible by ....Valve.

4. According to working principle how do you classify the control valve?

5. What is the status of settling time in Preact control and why?

6. Which controller is used for Temperature control process?

7. What is the basic activation function used in neural networks?

8. What is the difference between the conventional control system and complex control systems?

9. What is knowledge base in fuzzy logic?

10. Feed forward control system is used for making variation in minor load variables. Say true or false.

11. Self Tuning control otherwise called as.........................

12. When the cascade control system will be ineffective?

13. Give any application for unsupervised learning method.

14. What are the composition operations in Fuzzy logic?

15. What are the types of architecture in neural networks?

16. 12 psig process signal equals to .... in electronic signal.

17. What is the offset that results from 10% change in 'P' Controller output when proportional gain is 0.5?

18. Feed forward control is used independently. Say yes or No. Justify your answer.

19. Feed control to a chemical reactor where particular proportion of component is to be maintained is an example of..................

20. Which controller mode is preferred, when sensor is susceptible to noise?

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PART B

II. When pen point and set point are suddenly deviated by 0.5cm at t=0 onwards, the response of PI controller is given below. Find K_p & T_r. (Assume $Z_0' = 12ma$)

Time	Z
Less than 0	12 ma
0	14 ma
2 min	15 ma
7min	17.5ma

[3M]

III. Using Hebb rule, train the OR Gate to the neural network. Try the maximum possible ways and indicate your comments. The order for training is

X_1	X_2
1	1
1	0
0	1
0	0

[4.5M]

IV. A H_2O tank looses heat such that the temperature drops by 2K/min. When the heater is on, the system gains the temperature of 4K/min. An on - off controller has ∴ 0.5min control lag and a differential gap of ±4% of the set point, about the set point of 323K. Plot the heater temperature versus time and find the oscillation period.   [2.5M]

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Course No	: INSTR C312
Course Title	: INDUSTRIAL INSTRUMENTATION & CONTROL
Date	: 01.03.09

Time: 50 Minutes   M.M = 25 (25%)

NOTE: 1. All the symbols and words carry their usual meanings, unless otherwise stated.

2. **Answer all the questions.**

1. Design a RLD, LLD for the following requirements.

The application requires an alarm to sound when a supply system leaks 5lb or more of raw material in to the vessel after a preset weight of 500 lb has been reached. When the start push button is pressed the filling solenoid and filling indicating light are turned on and raw material is allowed to flow in to the vessel. When the weight is reached 500 lb the filling solenoid is deenergized and the flow is cutoff. At the same time, the filling indicating light is turned off and filling pilot light is turned on. If the filling solenoid leaks 5lb or more of raw material in to the vessel, the alarm will energize and stay energize until the over flow level is reduced below 5 lb over flow limit. (Make use of Subtraction instruction).   [6M]

2. Draw the PLC program for the following application.

Three motors have to be started with the following sequences.
   a. Start the motor one   immediately once the start push button is pressed.
   b. Start the motor two and stop the motor one after 15 sec the motor one is started.
   c. Start the motor three and stop the motor two after 15sec the motor two is started.
   d. Stop push button is provided to stop all the motors at any time

Make use of single timer for programming the PLC.   [6M]

3. Explain the Architecture of PLC with neat diagram.   [6M]

4. A. Draw the RLD for the following motor control specifications.
   a. A motor must be started and stopped from any one of the three start and stop push button stations.
   b. Each start and stop stations contains one NO start button & one NC stop button.
                                                                                                                       [2.5M]
   B. Draw the RLD to turn the lights L1 and L2 on and off using latch instructions. You are provided with two pushbuttons for on and off the lights.   [2.5M]

   C. What are the programming languages of PLC?   [2M]

BITS, PILANI .DUBAI
Dubai International Academic City, Dubai, UAE
Semester II   2008-2009
QUIZ III (Closed Book)
BE (Hons) III year EIE

Course No   : INSTR C312
Course Title : INDUSTRIA INSTRUMENTATION & CONTROL
Date   :   Time: 15Minutes   M.M = 10 (5%)

Note: Tick the appropriate one of the given options. Each question carries 1mark. All the symbols and words carry their usual meanings, unless otherwise stated.

Find maximum-minimum, maximum- product and relational joint of A & B

$$A = \begin{bmatrix} 1.0 & 0.0 & 0.7 \\ 0.3 & 0.2 & 0.0 \\ 0.0 & 0.5 & 1.0 \end{bmatrix} \qquad B = \begin{bmatrix} 0.6 & 0.6 & 0.0 \\ 0.0 & 0.6 & 0.1 \\ 0.0 & 0.1 & 0.0 \end{bmatrix} \qquad [5\ M]$$

BITS, PILANI .DUBAI

Dubai International Academic City, Dubai, UAE
Semester II   2008-2009
QUIZ II (Closed Book)
BE (Hons) III year EIE

Course No   : INSTR C312
Course Title   : INDUSTRIAL INSTRUMENTATION & CONTROL
Date   :   Time: 15Minutes   M.M = 10 (5%)

Note: Each question carries 1mark. All the symbols and words carry their usual meanings, unless otherwise stated.

1. Define differential gap.

2. Proportional controller as a single mode, how will you eliminate the offset?

3. Derivative controller as a single mode, is not recommended for any process. Why?

4. What is the disadvantage of PID controller?

5. How will you calculate the Log ratio in process reaction curve method?

6. How will you calculate the controllability ratio in Cohen coon method?

7. What is the type of the valve or port which will give the quick opening characteristics?

8. What is the difference between single seated and double seated valve in construction?

9. What is PTFE in lined butterfly valve?

10. How Louvers valve is different form butterfly valve?

Name :   ID No:

BITS, PILANI .DUBAI
Dubai International Academic City, Dubai, UAE
Semester II   2008-2009
QUIZ I (Closed Book)
BE (Hons) III year EIE

Course No   : INSTR C312
Course Title   : INDUSTRIAL INSTRUMENTATION & CONTROL
Date   :   Time: 15Minutes   M.M = 10 (5%)

Note: Tick the appropriate one of the given options. Each question carries 1mark. All the symbols and words carry their usual meanings, unless otherwise stated.

1. Decide whether each of these statements is True (T) or False(F).
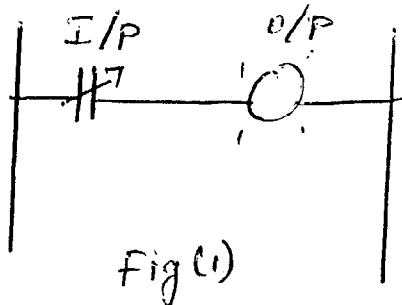
Fig.(1)

Fig.(1) shows a ladder diagram rung for which:
(i) The input contacts are normally open.
(ii) There is an output when there is an input to the contacts.
   a. (i) T   (ii) T
   b. (i) T   (ii) F
   c. (i) F   (ii) T
   d. (i) F   (ii) F

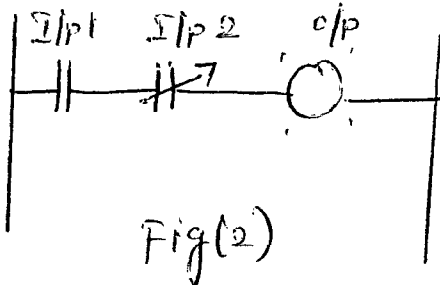2. Decide whether each of these statements is True (T) or False(F).

Fig(2)

Fig.(2) shows a ladder diagram rung for which:
(i) When only input 1 contacts are activated, there is an output.
(ii) When only input 2 contacts are activated, there is an output.
   a. (i) T   (ii) T
   b. (i) T   (ii) F
   c. (i) F   (ii) T
   d. (i) F   (ii) F

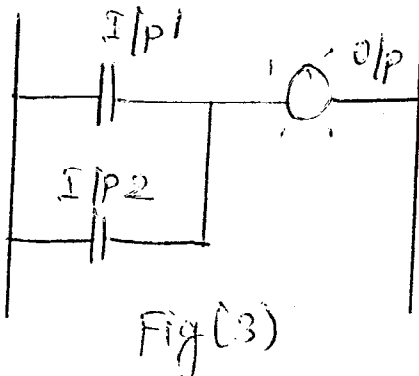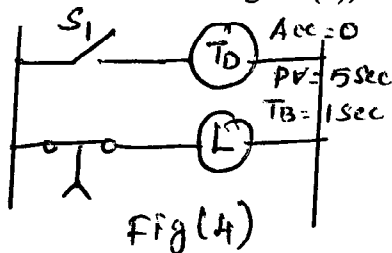3. Decide whether each of these statements is True (T) or False(F).

Fig(3)

Fig.(3) shows a ladder diagram rung for which there is an output when,
(i) Input 1 or 2 is activated.
(ii) Either one of the inputs 1 and 2 is not activated.
   a. (i) T   (ii) T
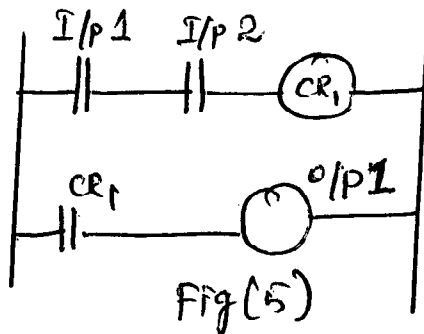   b. (i) T   (ii) F
   c. (i) F   (ii) T
   d. (i) F   (ii) F

4. In the circuit in Figure (4), the light will stay on:

Fig (4)

   a. as long as S1 is closed.
   b. for 5 sec after coil TD is energized.
   c. when the coil TD is de energized.
   d. both a and c.

5. Decide whether each of these statements is True (T) or False(F).
   For the ladder diagram shown in Figure(5) , there is an output from output 1 when:

Fig (5)

   (i) There is just an input to In1
   (ii) There is just an input to In2
       a. (i) T   (ii) T
       b. (i) T   (ii) F
       c. (i) F   (ii) T
       d. (i) F   (ii) F

6. Decide whether each of these statements is True (T) or False(F).
   For the ladder diagram shown in Figure (5) , there is an output from output 1 when:
   (i) There is an input to In2 and a momentary input to In1.
   (ii) There is an input to In1 or an input to In2.
       a. (i) T   (ii) T
       b. (i) T   (ii) F
       c. (i) F   (ii) T
       d. (i) F   (ii) F

7. The status bit of Examine off instruction is examined and found to be 1. What does this mean with respect to output?

8. Draw RLD for AND gate Application.

9. What is the format for addressing the PLC?

10. Draw the RLD to turn on the red light using Examine on instructions.