BITS, PILANI – DUBAI CAMPUS
Knowledge Village, Dubai
Year III – Semester II 2005– 2006

COMPREHENSIVE EXAMINATION (Closed Book)

Course No : **INSTR UC312**

Course Title : **Industrial Instrumentation & Control**

Date : **May 30th 2005**

Time : **3 Hours** **Max.Marks : 40(40 %)**

NOTE:

1. ***ANSWER ALL QUESTIONS.***
2. ***ALL QUESTIONS CARRY EQUAL MARKS.***
3. ***WRITE ANSWERS IN SEQUENTIAL ORDER.***

(8*5=40)

1. Draw the RLD diagram for the following application.
   Three motors have to be started with the following sequences.
   1. Start the motor one immediately once the start push button is pressed.
   2. Start the motor two and stop the motor one after 15 sec the motor one is started.
   3. Start the motor three and stop the motor two after 15sec the motor two is started.
   4. Stop push button is provided to stop all the motors at any time.

   Make use of single timer for programming the PLC.

2. Draw a table and compare the below mentioned parameters for the P, I, D controllers.
   a. Rise time,
   b. Overshoot,
   c. Settling time,
   d. Steady state error.

3. Explain in detail about Distributed Control System architecture with neat diagram. What are the important features of DCS.

4. a. An electronic PI controller is subjected to the error 3, PB = 40%.& Reset time is 5 min . Find the output when the controller output saturates. Assume the controller output when error was zero at last instant is 50. (2.5M)

b. 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) (2.5M)

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

5. A transient disturbance test is run on a process loop. The results of a 9% controlling variable change give a process –reaction graph as shown in Fig 1.

a. Find the settings for three mode action

b. Find the three mode settings for a quarter- amplitude response.

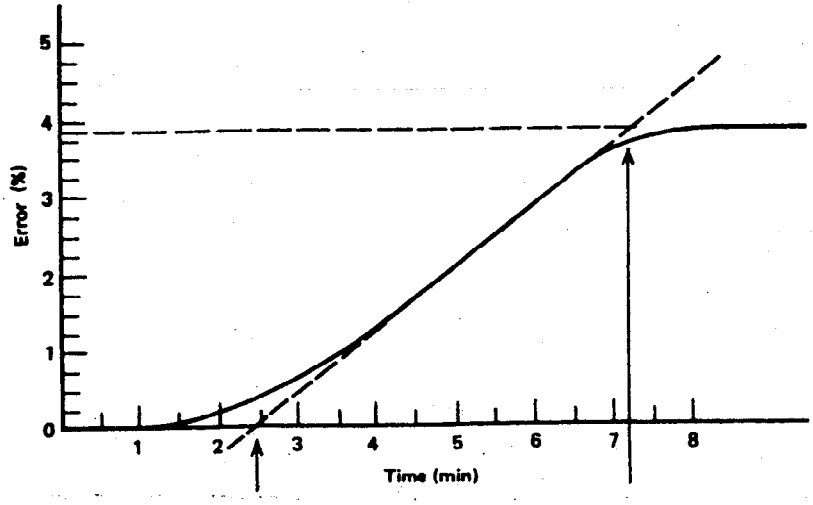

Fig.1

6. a. What is Adaptive control? Explain the types of adaptive control. (3M)

b. What are the classifications of control valve according to the stem motion?(2M)

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

X1	X2
1	1
1	0
0	1
0	0

8. a. Define offset.

b. ITAE stands for..... And when it is used?

c. Which type of control valve is used for chemical fluids?

d. What are the activation functions in artificial neural network?

e. What are the defuzzification methods?

ALL THE BEST

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Year III – Semester II 2005 – 2006

TEST II (Open Book)

Course No: INSTR UC312

Course Title: Industrial Instrumentation & Control

Date: 30.04.05 **Time: 50 Minutes** **M.M = 20(20%)**

NOTE : ONLY TEXT BOOK IS ALLOWED

ANSWER ALL THE QUESTIONS

1. Using Hebb rule, train the EX-OR gate to the neural network. Try the maximum possible ways and indicate your comments. The order is

X1	X2
1	1
0	1
1	0
0	0

(6.5 M)

2. Find A⊖B , A⊙B , A * B

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

(6 M)

3. Fuzzy set A = x considerably larger than 10.

$\mu_A(x) = \{ 1 + (x - 10)^{-2} \}^{-1}$

Fuzzy set B = x closer to 11.

$\mu_B(x) = \{ 1 + (x - 11)^{4} \}^{-1}$

Find the union(C) , intersection (D) operations and compliment of A and B . Draw the graph for all the membership functions.

(4 M)

4. Under what condition we should go for FF + FB complex control system. What will be advantages and disadvantages? (2.5)

5. What do you mean by adaptive control? (1M)

Id No: Name:

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Year III – Semester II 2005 – 2006

QUIZ I (Closed Book)/ VERSION B

Course No: INSTR UC 312 Course Title: Industrial Instrumentation & Control

Date: 13.04.05 Time:30 Minutes M.M = 20 (10%)

ANSWER ALL THE QUESTIONS

1. Weir valve otherwise called as .....

2. Which control valve has elastomer?

3. Optimal control can be obtained by..... valve.

a. Oversized valve **b. Undersized valve**

c. Smallest valve **d. Largest valve**

4. What is relay sequencer?

5. Ladder Logic in PLC programming is ..... level programming.(Higher / Lower)

6. Draw the RLD to implement NOT operation.

7. Which instruction can reduce the scan time in PLC?

8. Define differential gap.

9. Which control is called as automatic Reset control.

a. P control b. I control

c. PI control d. PID control

10. What is the offset that results from 5% change in 'P' Controller output when proportional gain is 0.1?

11. ISE stands for..... & when it is used?

12. Ziegler Nichols method otherwise called as .....

13. In process reaction curve Log ratio (R) = ...

a. $\Delta C_p / T$ b. $\Delta P/NL$

c. $NL/\Delta C_p$ d. $\Delta C_p/NL$

14. Ziegler Nichols method can be used for systems with self regulation. (True / False)

1 5. In Flapper nozzle arrangement the air gap and signal pressure has ..... Relationship. (Linear / Non linear)

16. In Pneumatic PID controller the proportional gain, Integral time & Derivative time Parameter are set by ..... & .....

17. Equal percentage Valve otherwise called as..... (Increasing sensitivity / Decreasing Sensitivity)

18. In open loop transient response method, the calculation of T_D is ..... for the PID mode.

a. 0.5L **b. 3.33L**

c. 2L **d. 0.3L**

19. Which controller is used for Temperature control process.

a. PD Control. **b. PI control**

c. P control **d. PID control**

20. In Integral mode the stability will ..... (increase/ Decrease)

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Year III – Semester II 2005– 2006

TEST I (Closed Book)

Course No: INSTR UC312

Course Title: Industrial Instrumentation & Control

Date: 19.03.05 **Time: 50 Minutes** **M.M = 20(20%)**

ANSWER ALL THE QUESTIONS

1. Design A RLD for the following Requirements:

The application requires an alarm to sound when a supply system leaks 5 lb 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 pilot light are turned on and raw material is allowed to flow in to the vessel. When the weight reached 500 lb the filling solenoid is deenergised and the flow is cut off. At the same time, the filling pilot light is turned off and the full pilot light indicator is turned on. If the filling solenoid leaks 5 lb or more of raw material in to the vessel, the alarm will energise and stay energise until the over flow level is reduced below the 5 lb over flow limit.

(5 Marks)

2. Draw the RLD and LLD to sequentially energise solenoid A, B, C, D with the time delay of 5 secs each other. Use the data Manipulation Instruction.

(5 Marks)

3. The elevator shown in Fig.1 employs a platform to move objects up and down. The global objective is that when the UP button is pushed, the platform carries something to the up position, and when the DOWN button is pushed , the platform carries something to the down position.

The following hardware specifications define the equipment used in the elevator.

Output Elements

M1 = Motor to drive the platform up

M2 = Motor to drive the platform down

(PTO)

Input Elements

LS1 = NC limit switch to indicate UP position
LS2 = NC limit switch to indicate DOWN position
START = NO Push button for START
STOP = NO Push button for STOP
UP = NO push button for UP command
DOWN = NO push button for DOWN command

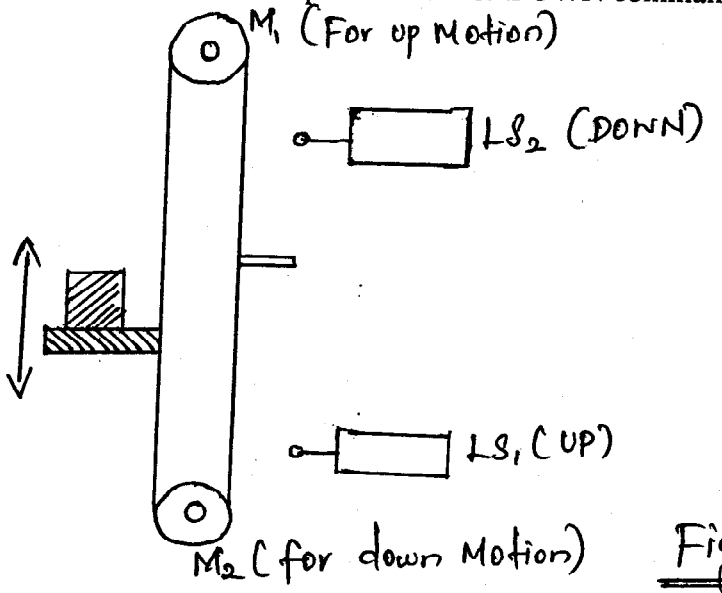

Fig. 1 : Elevator System.

The sequence of events for the elevator system.

1. When the START button is pushed, the platform is driven to the down position.
2. When the STOP button is pushed, the platform is halted at whatever position it occupies at that time.
3. When the UP button is pushed, the platform, if it is not in downward motion, is driven to the UP position.
4. When the DOWN button is pushed, the platform, if it is not in upward motion, is driven to the down position.

Prepare a Ladder diagram to implement this control function. (7 Marks)

4. a. Using the Latch instruction turn on and off the Red light. You are provided with two push buttons. (1.5 Marks)

b. What is Non Retentive Timer? (1.5 Marks)