

BITS, PILANI – DUBAI
Dubai International Academic City, Dubai, UAE
Year III – Semester II 2007 – 2008

COMPREHENSIVE EXAMINATION (Closed Book)

Course No : INSTR UC312
Course Title : Industrial Instrumentation & Control
Date : 1st June 2008
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. Draw the RLD diagram 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.

[5 M]

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

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

$$B = \begin{bmatrix} 0.6 & 0.6 & 0.0 \\ 0.0 & 0.6 & 0.1 \\ 0.0 & 0.1 & 0.0 \end{bmatrix}$$

[5 M]

3. a. Explain in detail about Distributed Control System architecture with a neat diagram.

b. What are the important features of DCS?

[3+2 M]

4. a. What is meant by inferential control system? Explain about it.

b. What is the working principle of Artificial intelligence system?

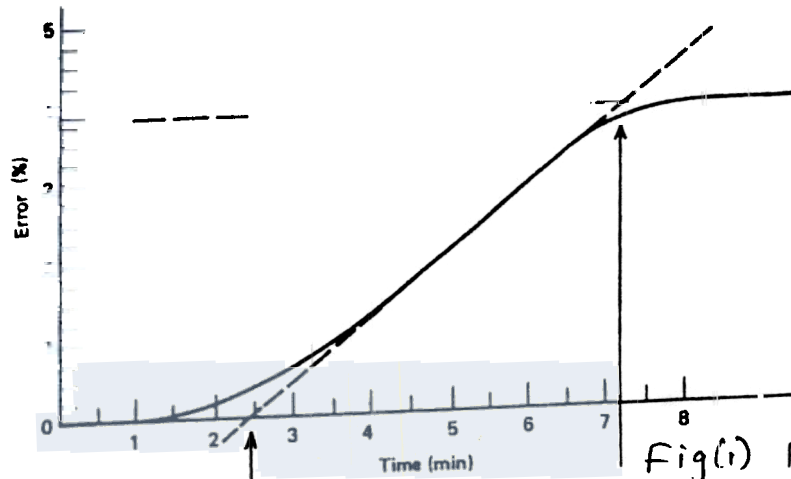
[2.5 +2.5M]

5. A transient disturbances test is run on a process loop. The result of 9% controlling variable change gives a process reaction graph as shown in Fig 1

a. Find the settings for three mode actions.

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

[2+ 3 M]



6. a. Explain about artificial neuron structure.

b. Explain about the architectures of artificial neural network.

c. Mention the application of supervisory and unsupervised learning method

[1+3+1 M]

7. a. An electronic PI controller is subjected to the error 3, $PB = 80\%$. & Reset time is 2 min. Find the output when the controller output saturates. Assume the controller output when error was zero at last instant is 50.

b. A H_2O tank loses 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 a $0.5min$ control lag and a differential gap of $\pm 4\%$ of the setpoint, about the setpoint of $323K$. Plot the heater temperature vs time and find the oscillation period.

[2 +3 M]

8. a. What are the advantages & disadvantages of Integral controller?

b. What are the types of butterfly valves?

c. What are the time integral performance criteria methods? Explain it

[1+1+3]

ALL THE BEST

BITS, PILANI – DUBAI
Dubai International Academic City, Dubai, UAE
Semester II 2007-2008

TEST II (Open Book)
BE (Hons) III year EIE

Course No : INSTR UC312
Course Title : INDUSTRIAL INSTRUMENTATION & CONTROL
Date : 11.05.08
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

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

X_1	X_2
1	1
0	1
	0
0	0

[7.5 M]

2. Find the Truth ness of each proportion given.

The Ranges are,

Age 15 to 45 Years

Weight 30 to 50 Kg

Height 4 to 6 Feet

The crisp data's are Age = 30 Years, Height =5 feet, Weight =35 Kg

1. You are young or Normal and tall is true.
2. You are tall and average or old is very true

[5 M]

3. A. Under what condition we should select FFC + FBC system. What will be advantages and disadvantages?

[2.5 M]

- B. Mention any four major differences between FFC and FBC

[2 M]

4. A. What is meant by cascade control system?

B. Under what situation we have to select the cascade control system?

C. List the reason not to use cascade control

[3 M]

BITS, PILANI – DUBAI
Dubai International Academic City, Dubai, UAE
Semester II 2007-2008
TEST I (Closed Book)
BE (Hons) III year EIE

Course No : INSTR UC312
 Course Title : INDUSTRIAL INSTRUMENTATION & CONTROL
 Date : 30.03.08
 Time: 50Minutes
 M.M = 25 (25%)

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

2. Answer all the questions.

1. Draw the RLD and LLD to sequentially energize solenoid A, B, C, D with the time delay of 5 sec's each other. Use data manipulation instruction.

[5 M]

2. Using Multiplication Instruction, form the ladder diagram for an oven temperature control Program. In this, PLC calculates the upper and lower dead band or on/off limits about the set point. The set point temperature is adjustable by means of thumbwheel switches and an analog thermocouple interface module is used to monitor the current temperature of the oven. In this example the set point is 400°F. Therefore the electric heater will be turned on when the temperature of the oven drops of less than 396°F and stay on until the temperature rises above 404°F.

[5 M]

3. 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 $Z_0 = 12\text{ma}$)

<u>Time</u>	<u>Z</u>
Less than 0	12 ma
0	14 ma
2 min	15 ma
7min	17.5ma

[5 M]

4. a. An integral controller is used for speed control with a set point of 12 rpm with in a range of 10 to 15 rpm. The controller output is 22% initially. The constant $K_I = -0.15\%$ controller output per second per percentage error. If the speed jumps to 13.5rpm, calculate the rate of controller output change & controller output after 2 sec's for a constant e_p .

[3 M]

b. Define differential gap.

[2 M]

5. a. What are the different tuning methods used for controllers.

[2 M]

b. Using the latch instruction turn on and off the red light. You are provided with two push buttons.

[3 M]