

Eighth Semester B.Tech Degree Examination.(2008 Scheme)

Branch : Applied Electronics and Instrumentation

NON-LINEAR CONTROL THEORY

(Model questions)

Max.marks : 100

Time : 3 hours

Part – A

(Answer *all* questions)

(10 x 4 = 40 marks)

1. Check whether the system $y = ax + b \frac{dx}{dt}$ is Linear or Nonlinear.
2. What is Limit cycle ? Explain Stability of Limit cycle
3. What are different types of State space representations of discrete time systems ?
4. Draw and explain “ jump resonance” in mechanical systems
5. What is Singular point and how are they classified ?.
6. Explain the need for observability test and controllability test
7. Explain Liapunov Analysis of Linear Time-Invariant Systems
8. Briefly explain popov’s stability criterion.
9. Briefly explain the concept of “ Feedback Linearization”.
10. Write short notes on MIMO systems.

Part – B

(Answer any *Two* questions from each module)

Module I

11. What are different types of Non-linearity present in the Non-linear systems. Explain in detail.
12. Explain the procedures for obtaining solutions of state equation for a Homogeneous and Non-Homogeneous systems.
13. A linear second order servo is described by the equation where . Determine the Singular point. Construct the Phase trajectory using the methods of Isoclines. Choose slope as -2.0, -0.5, 0, 0.5 and 2.0

Module II

14. Derive the describing function for a system with Saturation non-linearity. The input output relation is linear for $x = 0$ to S and when the input $x > S$ the output reaches saturated value of KS .

15. Consider the following System described by

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

Determine the Stability of the System by Liapunov method. Also obtain the Liapunov function

16. Write short notes on
- Lure's transformation
 - Circle criterion.

Module III

- 17 Explain Model predictive controller with a block diagram..
18 Consider the System described by the transfer function

$$\frac{Y(s)}{U(s)} = \frac{10}{s(s+1)(s+2)}$$

Design a State feedback controller so that the closed loop poles are placed at $-2, -1+j1$

20. Explain Self tuning regulators in detail with necessary diagrams.

Model Question paper

Eighth Semester B.Tech Degree Examination

Applied Electronics & Instrumentation.

08.803 Smart Sensors & Networks(A)

Time:3 hours

Max. Marks: 100

PART A

(Answer All questions)

(10x4=40 marks)

- 1 What are the various type of smart sensors?
- 2 Based on type of o/p signal , how sensors are classified?
- 3 Briefly explain plasma etching?
- 4 Sketch the architecture of intelligent sensor?
- 5 What is the concept of adhoc network ?
- 6 Compare wired and wireless network?
- 7 Briefly explain directed diffusion ?
- 8 Differentiate sensors and actuators?
- 9 What are the features of RS-485?
- 10 Mention a few routing techniques used in sensor network?

PART B

(Answer any **Two** questions from each module)

Module 1

(10x2=20 marks)

- 11 Explain LIGA process in detail ?
- 12 Compare surface micromachining and bulk micromachining?
- 13 Explain IC sensor technology with relevant diagram?

Module II

(10x2=20 marks)

- 14 Explain Bluetooth architecture
- 15 Explain layers of OSI model?
- 16 What are the different IEEE1451 standards?

Module III

(10x2=20 marks)

- 17 Explain various aggregation technique?
- 18 What are the application of wireless sensor network?
- 19 Explain different types of routing in sensor network?

MODEL QUESTION PAPER
Eighth semester BTech Degree Examination
Applied Electronics and Instrumentation Engg.
08.804 INDUSTRIAL INSTRUMENTATION (A)

Time: 3 hours

Max. Marks:100

PART A

(Answer ALL questions)

(10x4=40 marks)

1. What is the working principle of a strain gauge load cell?
2. Explain the working of a drag cup type tachometer.
3. Explain resonator pressure sensors.
4. With neat sketch, explain ac tachogenerators.
5. Mention a few mechanical type vibration measuring instruments.
6. Explain the working of a capacitive type pressure gauge.
7. Discuss the operation of a dead weight tester.
8. For a certain thermistor, $\beta=3140K$ and the resistance at $27^{\circ}C$ is known to be 1250Ω . The thermistor is used for temperature measurement and the resistance measured is 2500Ω . Find the measured temperature?
9. What are the guidelines for the selection of flow meters?
10. What is the working principle of a dew cell?

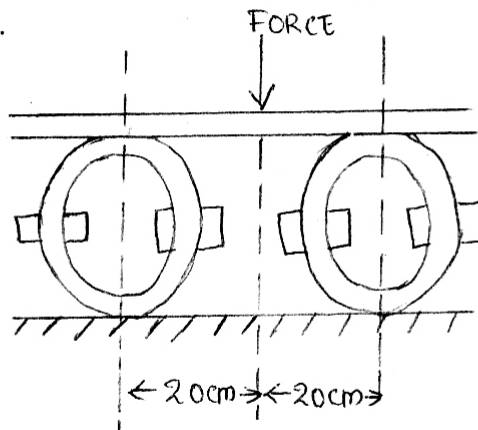
PART B

(Answer any *two* questions from each module)

MODULE I

(10x2=20 marks)

11. with neat sketches, explain the following:
 - (a) stroboscope
 - (b) ultrasonic densitometer
 - (c) Magneto-elastic load cell.
12. (a) Explain the working principle of an accelerometer.
(b) Explain variable reluctance type accelerometer.
13. A force is measured using two thin steel rings on which 8 resistance strain gauges are bonded, so as to give temperature compensation and high sensitivity. Resistance of each strain gauge is 150Ω , gauge factor =2 and battery voltage for the bridge 10V. the resistance of the output device is 1500Ω . For each ring radius is 20mm, width= 15mm and thickness=1.5mm. Young's modulus $E=2.1 \times 10^5 N/mm^2$. find the value of force applied corresponding to a bridge output of 1.5mV.



MODULE II

(10x2=20 marks)

14. Discuss any two electrical methods of temperature measurement in detail.
15. write notes on:
 - a. McLeod gauge
 - b. Ionization gauge
16. What are the various sources of errors in filled in system thermometers? Explain the various compensation techniques.

MODULE III

(10x2=20 marks)

17. Explain the principle and constructional details of electromagnetic flow meters.
 18. Explain the different types of ultrasonic flow meters.
 19. (a) how will you measure moisture in granular materials?
(b) explain the working of electrolysis type hygrometer.
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Eighth Semester B.Tech Degree Examination, April 2012

(2008 Scheme)

08. 805-DISTRIBUTED CONTROL SYSTEMS

Time: 3 Hours

Max.Marks:100

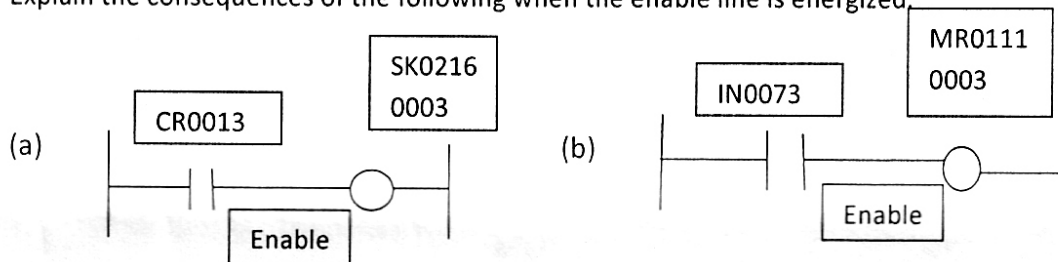
Instructions: 1) Answer *all* questions in Part A. *Each* question carries 4 marks.

2) Answer *any two* questions from *each* Module in Part B.

Each question carries 10 marks.

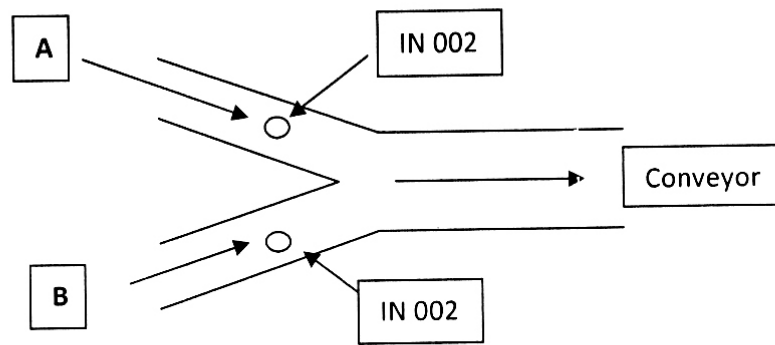
PART –A

1. Differentiate between retentive and non-retentive timers.
2. Write a PLC program to obtain an output P, in register OR 0055. The output is to give a value based on two inputs M and N. P is the sum of square of M and the square root of N.
3. How supervisory control and data acquisition is achieved in a SCADA system?
4. Explain sampling process with necessary mathematical expressions.
5. Compare a distributed and centralized control system.
6. Differentiate between MONITOR Mode AND FORCE Mode functions in PLC.
7. Explain CAN.
8. Draw the block diagram of a thermal power plant automation system.
9. Write short note on PID Module.
10. Explain the consequences of the following when the enable line is energized.



PART B MODULE-I

11. (a) Briefly explain the architecture of PLC.
(b) Write a PLC program to implement the given logic.
When a switch is turned on - C goes on immediately and D goes on 9 seconds later. Opening the switch turns both C and D off.
12. Implement the following logic using PLC.
The output indicator must go on when x parts of A and y parts of B are on the conveyor. IN 002 and IN 003 are proximity devices that pulse on when a part goes by them.



(b) Construct a PLC COMPARE function program for a light to come on only if the PLC counter has a value 45 or 78.

13. Design and implement a sequencer with timer pulsing. Explain the ladder sequence of the implementation.

MODULE II

14. Explain the hierarchy for a distributed control system. Also explain the functions at various levels.

15. a) Define CIM, plant controller, area controller and cell controller in connection with the networking of PLCs.

(b) Describe the five levels of industrial control and their interrelationship.

16. Design a non-modular synchronous wired logic controller to implement an electronic lock specified by the levels of two binary variables A and B. When power is switched on, the system is set at an initial state, from where the evolution of A and B is watched. The lock must open if A and B are operated in the following sequence:

- a. First A is activated and deactivated
- b. Then B is activated and deactivated.
- c. Finally, A is activated and deactivated again.

MODULE III

17. What are the objectives of automation system for cement plant? Explain the important automation strategy for individual units in cement plant?

18. What is HART protocol? Explain the frame structure and programming concepts of it.

19. (a) Draw the various fieldbus connection topologies

(b) With a block diagram explain the Foundation fieldbus architecture.

08 . 835

**Eighth Semester B.Tech Degree Examination
VLSI Structures for Signal Processing (A)**

Max. Marks 100
Time 3 hours

Part A
(Answer all questions)

1. How does pipelining an FIR filter affect its critical path and sampling rate?
2. Write short notes on data broadcast structure
3. How does pipelining a digital system result in power consumption reduction?
4. What is the approach adopted in algorithmic strength reduction techniques for digital filters.
5. Write the matrix form of the two parallel fast FIR filter by linear convolution.
6. Write notes on rank order filter architectures
7. Explain the modified Harvard architecture used in DSP processors with figures.
8. What are the features of SIMD and MIMD architectures
9. What are the advantages and disadvantages of use of FPGA for DSP applications?
10. What is the pipelining property of Schur algorithm?

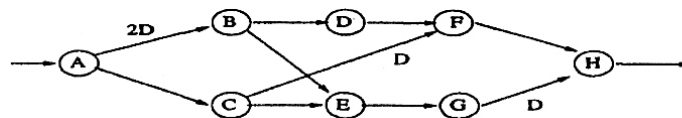
(4 * 10 = 40 marks)

Part B

(Answer two questions from each module)

Module I

11. Consider the DFG shown in figure; assume the time required for each operation is T.
 - (a) What is the maximum achievable sample rate in this system?
 - (b) Place pipelining registers at appropriate feed-forward cutsets such that the sample rate of this system can be approximately equal to $1/T$. Clearly identify the feed-forward cutsets and count the total number of pipelining registers required.



12. Consider a direct-form implementation of the FIR filter $y(n) = ax(n) + bx(n - 2) + cx(n - 3)$. Assume that the time required for 1 multiply-add operation is T.

(a) Draw block filter architecture for a block size of three. Pipeline this block filter such that the clock period is about T . What is the system sample rate?

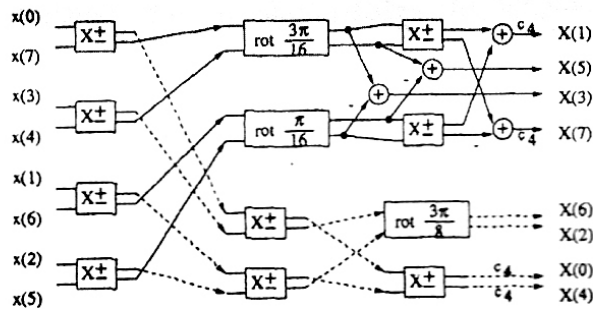
(b) Pipeline the block filter in part (a) such that the clock period is about $T/2$. Show the appropriate cutsets and label the outputs clearly. What is the system sample rate now?

13. Describe the techniques for pipelining IIR digital filter structures.

Module II

14. Derive the matrix form of the three-parallel fast FIR filter by polyphase decomposition.

15. Derive an 8-point IDCT architecture by transposing the structure in figure.



16. Write short notes on a) scaling b) round off noise in digital systems.

Module III

17. Describe the important features of DSP processors.

18. Describe the features of DSP processors for mobile and wireless communication.

19. Write notes about the FPGA implementation of DSP processors.

(6 * 10 = 60 marks)

MODEL QUESTION PAPER

8th SEMESTER B.TECH DEGREE EXAM(AE&I)

08.826 CONTROL OF POWER CONVERTERS(A)

Answer all questions in PART A and Any two questions from each module in PART-B

PART-A

1. What is the purpose of a converter in dc drive? What are the different types of dc drives based on input supply?
2. Explain the criteria for selection of drive components in power electronic drives?
3. What is the difference between one,two,four quadrant dc drives?
4. Explain the principle of regenerative braking of dc-dc converter fed dc motor drives?
5. What is synchronous speed ,slip and slip frequency of induction motors?
6. Explain the torque-speed characteristics of induction motor with the help of curve.
7. Draw equivalent circuit of synchronous motor and name various types of synchronous motors.
8. Explain the basic principle of vector control of induction motors?
9. Give a block schematic to generate the signals for the switches of a full bridge inverter to generate a quasi-square waveform?
10. Discuss the advantages of SVPWM and harmonic elimination method by staircase PWM
(4X10=40)

Part B

MODULE-1

2x10 = 20

11. Derive the transfer function of a converter fed separately excited dc motor drive ,starting from its equivalent circuit.
12. With the help of block diagram and transfer function ,explain the PLL control system for dc drive? *
13. The speed of a 20hp 300V 1800rpm separately excited dc motor is controlled by 3phase full converter drive. The field current is also controlled by 3phase full converter.The ac input is 3 ϕ ,Y connected ,208V,60Hz supply. The armature resistance is $R_a = 0.25\Omega$,the field resistance is $R_f = 245\Omega$ and the motor voltage constant is $K_v = 1.2V/Arad/s$. The armature and field currents can be assumed to be continuous and ripple free.The viscous friction is negligible. Determine (a)the delay angle of the armature converter α ,if the motor supplies the rated power at the rated speed; (b) the no load speed if the delay angles are the same as in (a)and the armature current at no load is 10% of the rated value;and(c)the speed regulation.

MODULE -2

2x10 = 20

14. A 3 ϕ ,11.2KW,1750rpm ,460V,60Hz four pole Y connected induction motor has the following parameters $R_s = 0.66\Omega$, $R_r' = 0.38\Omega$, $X_s = 1.14\Omega$, $X_s' = 1.71\Omega$ and $X_m = 33.2\Omega$.The motor is controlled by varying both voltage and frequency. The V/Hz ratio which corresponds to

- the rated voltage & frequency is maintained constant. (1) Calculate the maximum torque T_m and the corresponding speed for 60Hz & 30Hz (2) repeat (1) if R_s is negligible
15. Explain the closed loop control of induction motors with the help of block diagram.
 16. With the help of block diagram, explain the stator and rotor voltage control of induction motors

MODULE -3

2x10 = 20

17. Design a digital controller for a hysteresis current controller. Explain different steps in design?
18. Explain the principle of space vector modulation with the help of diagram. compare SPWM and SVPWM.
19. Explain the principle of operation of DC-AC converters and methods for voltage control in these converters. Compare different voltage control methods.

MODEL QUESTION
Eighth Semester B-Tech Degree Examination, April 2012
2008 Scheme
08-836 Virtual Instrumentation (A)

Time: 3 Hrs.
Max. Marks. 100

Instructions

i Answer all questions in Part A. Each question carries 4 marks

ii Answer any two questions from each module in Part B. Each question carries 10 marks

PART A

1. What are virtual instruments? Explain with an example
2. What is data flow programming?
3. What is a sub VI ? Explain.
4. Explain a formula node.
5. Which are the components of a DAQ system?
6. Distinguish Differential, RSE and NRSE measurement systems.
7. What is meant by current loop? Give specifications
8. Explain virtual instruments software Architecture [VISA].
9. Explain interchangeable virtual instruments [IVI]
10. How to use instrument I/O Assistant ?

PART B

Module -I

11. Explain the following in virtual instrumentation programming with examples.
 - i) FOR loop
 - ii) WHILE loop
 - iii) CASE structure
 - iv) FLAT and STACKED sequence structure
 - v) Shift registers.
12. a) Explain arrays, array creation and array functions
b) Explain a VI for realtime monitoring of a physical quantity
13. a) Explain clusters, cluster functions, cluster controls and monitors.
b) Explain web publishing tool in virtual instrumentation.

Module – II

14. a) Explain the basics of data acquisition using VI, with emphasis on type of signals and signal conditioning.
b) Explain the development of a VI for digital I/O.
15. a) Explain GPIB and RS232C interface architectures, bus signals and functions.

- b) Explain detecting, configuring instruments and use of instrument I/O assistant in VI environment.
16. Explain the following bus interfaces
- i) VXI
 - ii) SCSI
 - iii) PCI
 - iv) PXI
 - v) USB

Module – III

17. Explain the development of a VI for controlling an industrial system. Illustrate with suitable example.
18. Explain the development of a VI for retinal image acquisition and processing for detecting irregularities. Draw necessary diagrams.
19. Explain the application of Virtual Instrumentation for industrial communication. Draw necessary diagrams.