

College of Engineering, Pune

(An Autonomous Institute of Government of Maharashtra)

End Semester Examination

(IE 314) Instrument and System Design Semester - II

Academic Year: 2011-12
Class: Third Year B. Tech
Instructions:

Branch: **Instrumentation & Control**

1. All questions are compulsory.
2. Draw neat figures wherever required.
3. Assume suitable data if necessary.

Section II

Q. 11

- a. Noise can be reduced in an electronic system using many techniques; a single unique solution to most noise reduction problem does not exist. Justify? 3
- b. Two conductors each 10 cm long and space 2 cm apart, from the circuit. This circuit is located where there is 10 gauss magnetic field at 60 Hz. What is the maximum noise voltage coupled into the circuit from the magnetic field? 3

Q. 12

- a. List different signal ground categories and briefly explain their effective use over range of frequency. 3
- b. What do you mean by thermal noise? Draw the characteristics of thermal noise and explain 3

Q. 13

For the differential amplifier shown in fig. 1 R_1 and R_2 are 1% resistor with values of 4.7 K Ω and 270K Ω respectively 5

- a. What is the differential mode input impedance?
- b. What is differential mode gain?
- c. What is common mode input impedance?
- d. What is common mode gain?
- e. What is CMRR?

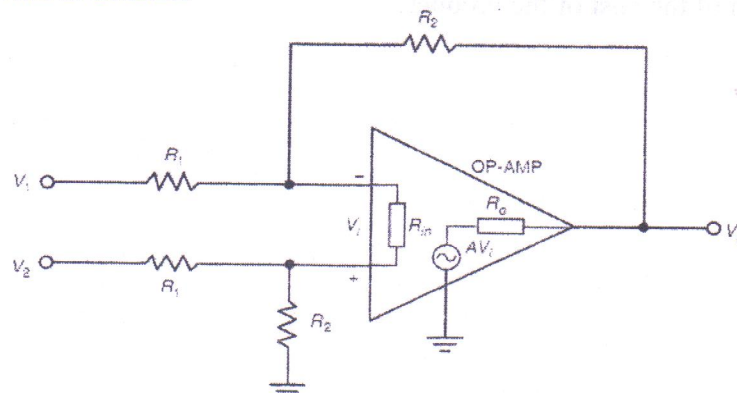


Fig.1

- Q. 14
- a. A shield that contains 10 identical holes in linear array is required to have 30 dB of shielding effectiveness at 100 MHz. What is the maximum linear dimension of one hole? 3
- b. What is shielding effectiveness? What are the parameters that affect the shielding effectiveness? 3
- Q. 15
- a. Which type of breakdown is hardest to prevent, glow discharge or arc discharge, and why? 3
- b. Draw human body model as a source of ESD and explain how it can be a primary source of discharge? 3
- Q. 16
- a. A mechanical switch, having silver contacts, is used to control 24 Volts dc relay with winding resistance of 240Ω and inductance of 10mH. If the switch contacts are protected by an RC network, what value resistor and capacitor should be used? For silver arcing current is 400mA and arcing voltage is 12 Volts. 3
- b. Compare standards and technical specifications of a system? 3
- Q. 17
- a. What do you mean by reliability of a system? Draw a bath tub curve and explain the importance of the same? 3
- b. At room temperature 290K what is the maximum noise voltage possible in 100Ω measuring system that has bandwidth of 100KHz? 3
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- Q. 18
- a. A manufacture performers are operating life test (OLT) on ceramic capacitors & find that they exhibits constant failure rate (used interchangeably with hazard rate) with a value of 3×10^{-8} failure per hour. What is the reliability of a capacitor after one year (10^4 Hrs) & in order to accept a large shipment of these capacitors, the user decided to run a test for 5000 hours on a sample of 2000 capacitors. How many capacitors are expected to fail during test? 3
- b. What do you mean by redundancy? How it can improve the reliability of a system explain with a practical example? 3
- Q. 19
- Explain in brief how standards help manufacture to improve the production and reduction of the cost of the product? 3

College of Engineering, Pune
Instrumentation & Control
IE – 314 Process Plant Operations

Academic Year: 2011- 12

Timing: 3 hrs

Max. Marks: 50

End Semester Examination

Instructions:

1. All Questions are compulsory.
2. Assume suitable data
3. Draw neat diagrams wherever necessary
4. Use of non programmable calculators are allowed

- | | | | |
|------|----|---|------------|
| Q. 1 | A. | Discuss different unit operations that are carried out in Sugar manufacturing process.
Explain Evaporation operation out of it and control scheme used for the same. | Marks
6 |
| OR | | | |
| | | Discuss different unit operations that are carried out in Waste water treatment plant.
Explain secondary treatment with chlorination and control scheme used for the same. | |
| Q. 1 | B | Explain working principle of fluidized bed dryer. Develop a control scheme for controlling the steam flow rate. | 4 |
| Q. 2 | A | Discuss different factors affecting rate of filtration and rate of sedimentation.
Explain rotary type of filter with suitable diagram. | 5 |
| Q. 2 | B. | In a cement manufacturing plant, product of Kiln i.e. Clinker is to be grounded for making gray cement. Suggest, explain and justify the equipments that can be used for the stated application.

List the equipments used for size reduction operation according to the expected product size. | 5 |
| Q. 3 | A. | There is a binary mixture which is to be separated. But the boiling points of those components are very near to each other. Select method of separation.
List and explain the equipments that can be used for operation | 5 |

- Q. 3 B. What are different types of reactors? Explain them briefly.
Develop a control strategy for a batch reactor with cascade control. 5
- Q.4 A. List and explain different theories for Corrosion.
If a mild steel block having a fine crack is kept humid environment, which
type of corrosion it will undergo? Explain this type of corrosion and method
to avoid it. 5
- Q. 4 B. Explain stress-strain curve for elastic material.
The hardness of SS304 is to be measured by indentation method. Suggest an
instrument that can be used for the purpose. Also explain the principle and
working of the instrument. 5
- Q. 5 A. Explain below operations:
(i) Batch Distillation 3
(ii) Unit operations in Tablet manufacturing 4
(iii) Water tube type boilers 3

-----Best of luck-----

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End Semester Examination

IE- Computational Algorithms and Applications

Branch: Instrumentation and Control

Academic Year: 2011~2012

Max. Marks: 50

Duration: 3 hrs

Instructions:

1. Solve any five questions.
2. All questions carry equal marks.
3. Assume suitable data if necessary.
4. Use of non programmable calculator is allowed

Q.1 A Obtain a root, correct up to three decimal places, using bisection method 3

$$x^3 + x^2 + x + 7 = 0$$

B Use the iterative method to find the root of 3

$$\cos x = 3x - 1 \text{ correct up to three decimal places}$$

C Obtain the root between 1 and 2 of following equation correct up to four decimal 4

places by Newton – Raphson method.

$$\sin x = 1 - x$$

Q.2 A Find the Larange's interpolating polynomial of degree 2 approximating a function 3
defined by the following table values. Hence determine the value of $y(2.7)$.

x	2	2.5	3
y	0.69315	0.91629	1.09861

B Certain corresponding values of x and $\log_{10} x$ are (300, 2.4771), (304, 2.4829), 3
(305, 2.4843) and (307, 2.4871). Find $\text{Log}_{10} 301$. By using Aitken's method

C For the table given below find value of $y(0.12)$, $y(0.26)$, $y(0.4)$ and $y(0.5)$ 4

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

Q.3 A Determine the constants a and b by the method of least squares such that 3
 $y = ae^{bx}$ fits the following data

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

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End Semester Examination

- B Fit a polynomial of second degree to the data points given in the following table 3

x	0	1	2
y	1	6	17

- C For $\frac{dy}{dx} - 1 = xy$ and $y(0) = 1$, obtain the Taylor series for $y(x)$ and compute $y(0.1)$ correct to four decimal places.

- Q.4 A Calculate the first and second derivatives of the function tabulated in the following table at the point $x = 2.2$ and also calculate first derivative at $x = 2.0$. 4

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

- B Evaluate $I = \int_0^1 \frac{1}{1+x} dx$ correct to three decimal places by trapezoidal and Simpson's rules with $h = 0.25, 0.5, 0.125$ respectively 6

- Q.5 A Evaluate the following integral using the Simpson's 3/8 rule. $h = k = 0.5$ 4

$$I = \int_0^1 \int_0^1 e^{x+y} dx dy$$

y\X	0	0.5	1.0
0	1	1.6487	2.7183
0.5	1.6487	2.7183	4.4817
1.0	2.7183	4.4817	7.3891

- Q.5 B Find the solution of the system using Jacobi and Gauss-Seidel methods to three decimals. 6

$$83x + 11y - 4z = 95$$

$$7x + 52y + 13z = 104$$

$$3x + 8y + 29z = 71$$

- Q.6 A Find the value of y when $x = 1$ given that $y = 1$ when $x = 0$ and 5

$$\frac{dy}{dx} = \frac{y-x}{y+x} \text{ using Runge Kutta fourth order method}$$

- B For $\frac{dy}{dx} = 1 + y^2$ find the value of $y(0.8)$ 5

where $y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, y(0.6) = 0.6841$.

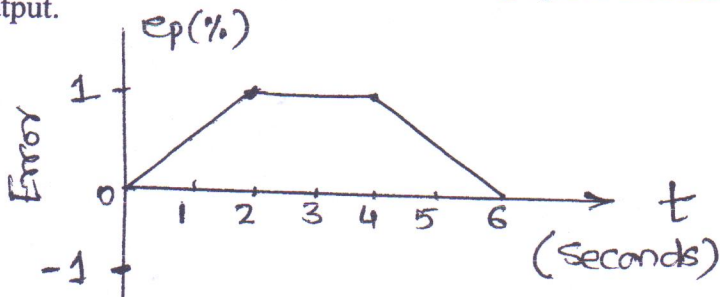
College of Engineering, Pune
Third Year – Instrumentation & Control
SUB: Process Loop Components (IE-312)
END Semester Exam

Semester **VI**
 Academic Year: 2011- 12

Timing: 3.0 hrs
 Max. Marks: 50

Instructions:

1. All questions are compulsory
2. Assume suitable data
3. Draw neat diagrams wherever necessary
4. Use of non programmable calculators are allowed

Q. 1	A.	Explain following terms: i) Manipulated variable ii) Live zero iii) 4-20mA current loop iv) Neutral zone v) Trim	Marks 5
	B.	We are using differential pressure transmitter for steam flow measurement. What precaution user must take to have less error in measurement?	5
Q. 2	A.	Describe 'flashing' and 'cavitation' condition of control valve	4
	B.	Level is being controlled in a tank. The flow ranges is 100 to 1000gpm. The liquid is mineral oil and has a specific gravity of 0.88. Line pressure is 100 to 150 psi and the throttling pressure drop varies from 50 to 100 psi. calculate range ability of the valve.	4
	C.	For selecting a control valve to specific application which factors user have to consider. Explain with example.	2
Q-3	A.	Error shown in graph is applied to proportional-derivative controller with $K_p= 5$, $K_D= 0.5$ s, and $P_o = 20\%$. Draw a graph of the resulting controller output. 	5

	B.	What do you mean by controller tuning? Explain Ziegler-Nichols closed loop tuning method.	5
Q-4	A.	Develop a ladder logic for following application: A buffer can hold up to 10 parts. Parts enter the buffer on a conveyor controller by output <i>conveyor</i> . As parts arrive they trigger an input sensor <i>enter</i> . When a part is removed from the buffer they trigger the <i>exit</i> sensor. Write a program to stop the conveyor when the buffer is full, and restart it when there are fewer than 10 parts in the buffer. As normal the system should also include a start and stop button.	5
	B.	Operate pneumatic double acting cylinder with PLC, what components are required to build the system? Draw ladder logic for same.	5
Q-5	A	Which factors contributes to hazardous area classification.	5
	B	How to decide safety integrity level for a specific application explain with help of risk graph.	5