

Electronics Systems Design

Q. P. Code: 36606

Total Marks: 80

(3 Hours)

Note:

1. Question No.1 is compulsory
2. Solve any THREE questions out of remaining FIVE questions.
3. Figure to the right indicate full marks.
4. Assume suitable data if required.

Q 1 Answer the following: (20)

- a) Write difference between passive and active filters. Give uses of Low pass and high pass filters.
- b) Explain operation of chopper amplifier.
- c) Write differences in functioning and applications of voltage references and current references.
- d) Explain meaning of conversion time and resolution of ADC.
- e) Write advantages and disadvantages linearly regulated power supply over switched mode power supply.

Q 2 a) Explain voltage to frequency converter circuit and important design criteria to be considered. (10)

- b) Explain weighted resistor network DAC. How the limitations of weighted resistor network DACs are overcome using R-2R ladder network? (10)

Q 3 a) Explain important performance parameters in analog comparator circuit and explain need of hysteresis in comparators. (10)

- b) Discuss advantages of switched capacitor filter over analog filters. Discuss design of basic switched capacitor filter and problems associated with it. (10)

Q. 4 a) Explain working of half wave millivolt rectifier circuit. Justify the use of op-amp in this circuit. (10)

- b) Discuss the performance parameters of analog switches and their significance. (10)

Q. 5 a) Explain design of DC to DC converter with its uses. (10)

- b) Explain various issues involved in power management for mixed signal processing circuits. (10)

Q. 6 a) Discuss the important parameters of sample and hold circuit. (10)

- b) What is the necessity of blocking DC contents present in the input signal of Instrumentation amplifier? Discuss methods which are used to block DC contents in Instrumentation amplifier. (10)

Time : 3 Hours

Marks : 80

Please check whether you have got the right question paper

1. Question No.1 is compulsory
2. Attempt any three questions out of the remaining five questions.
3. Assume suitable data wherever necessary.

- Q. 1 Explain Briefly 20
- a) Random number generator
 - b) Probability density function
 - c) Bayes theorem
 - d) Principal component analysis
 - e) Fractional calculus
- Q. 2 a) What do you mean by "mean" and "variance" of a random variable? How are they related to probability density function? 10
- b) Explain the stochastic characteristic of any one discrete random variable, illustrating clearly the relationship between probability mass function, mean and variance. 10
- Q. 3 a) Assume that X and Y are two random variables and $Y = f(X)$. Derive the equation to show how error in the random variable X will get reflected in the random variable Y. 10
- b) What is conditional Gaussian density? Explain how this concept can be used to derive kalman filter. 10
- Q. 4 a) Explain how the states of a non-linear system can be estimated without linearizing it. 10
- b) Write a brief note on particle filtering. 10
- Q. 5 a) Explain how fractional derivative $\frac{d^\alpha(t^m)}{dt^\alpha}$ can be obtained using gamma function, assume $\alpha < 1$ 10
- b) Differentiate between ergodic process and stationary process. 10
- Q. 6 Write short notes on 20
- a) Shot Noise
 - b) Power spectrum of a random process

Q. P. Code: 24146

Total Marks: 80

(3 Hours)

Note:

1. Question No.1 is compulsory
2. Solve any THREE questions out of remaining FIVE questions.
3. Figure to the right indicate full marks.
4. Assume suitable data if required.

1. Answer the following (any 04) :- (20)
 - a) Write evolution of communication protocol and their advantages.
 - b) Explain the generic architecture of DCS.
 - c) Explain safety integrity level (SIL).
 - d) Explain entity concept.
 - e) What is meant by process modeling? Explain its need.
2. a) Explain communication between RTU and MTU with protocol structure. (10)
b) Explain the term constraint control. Explain MISO constraint control with suitable example. (10)
3. a) Explain the procedure to design a PLC based system. (10)
b) Explain scan interval in case of SCADA. (10)
4. a) Explain the difference between process automation and factory automation. (10)
b) Write a note on DCS. (10)
5. a) Explain High Power trunk Concept in detail. (10)
b) Explain the life cycle of SIS. (10)
6. Write short notes on—[any two] (20)
 - a) Model equation of evaporator
 - b) DART
 - c) Compare FISCO & FNICO

Q.P.Code: 21825

Duration 3 Hours

[Total Marks: 80]

Note: 1. Question No. 1 is compulsory.

2. Attempt any three questions from remaining five questions.

3. Assume suitable data if necessary.

- Q. 1 a) Explain one method of Time to Amplitude Conversion. 05
- b) State performance parameters of gamma camera. 05
- c) State advantages and limitations of Wilkinson technique used for nuclear ADC. 05
- d) Explain why liquid scintillators are preferred over solid scintillators for counting beta particles emitted from tritium. 05
- Q. 2 a) Explain need and working of Gatti's Sliding Scale technique. 10
- b) Explain working of various modes of Multichannel analyser. 10
- Q.3 a) Explain how coincidence detection technique helps to reduce effect of noise. 10
- Explain one use of this technique with block diagram. 10
- b) Explain meaning and working of Self Powered Neutron Detectors. 10
- Q.4 a) Explain need and nature of accelerator instrumentation. 10
- b) Explain need and working of Trigger system in astrophysics experiments. 10
- Q.5 a) Explain the need and working of Charge to Digital convertor. 10
- b) Explain need and working of Linear shaping amplifiers. 10
- Q.6 Write short notes on any two of the following - 20
- a) Use of semiconductor detectors for Nuclear pulse spectroscopy..
- b) Counting interferences in Liquid Scintillation counting.
- c) performance parameters of Nuclear ADC .

Q. P. Code: 24774

(3 hours)

[Total Marks-80]

- N.B. (1) Attempt any four questions out of six questions
 (2) Assume any additional data if necessary and state it clearly
 (3) Explain answers with neat sketches wherever necessary

- 1 a) How Principle Research method different from Methodology? Give example to justify the difference. [10]
- b) Show the classification of research characteristics and discuss at least two classified characteristics with suitable example. [10]
- 2 a) Are quantitative and qualitative research types inter-related with each other? Justify your answer. [10]
- b) What are the methods for analyzing data in quantitative research? [10]
- 3 a) Show the significance of Sample design and describe essential steps to achieve good sampling design. [10]
- b) A car manufacturer claims that his cars will run for an average of 20,000 miles before needing their first repair. To prove this claim, you have tracked a test where you took random sample of 21 cars. It found that the sample average number of miles before repair was 18,700, with a standard deviation of 8,600 miles. If you have been asked to draw the random sample test analysis for this manufacturer what significant test limitations you can suggest or recommend to manufacturer while taking random sample of cars? [10]
- 4 a) There are various stages of scientific research process. Suppose you will have the opportunity to learn how to negotiate solutions to open engineering design problem using systematic design methods. What stages of scientific research process you will follow? Briefly discuss every stage that you like to consider. [10]
- b) What is the characteristic of Good Hypothesis? Explain type I and II errors, level of significance and variables in hypothesis. [10]
- 5 a) Identify any research area you are interested in. What procedural steps you will follow to formulate any research problem in this research area. Be specific to steps you follow and provide relevant description. [10]
- b) Summarize the difference between qualitative and quantitative two data collection methods. [10]
- a) Discuss the validity of research thoroughly. [10]
- b) "Ethics in research is the need of the hour". Justify the statement. [10]