



Manipal Institute of Technology, Manipal



(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (MECHATRONICS ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: DATA ACQUISITION AND SIGNAL CONDITIONING

[ELE 357]

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

• Answer **ANY FIVE FULL** the questions.

- ✤ Missing data may be suitably assumed.
- What is Graphical System Design in Virtual Instrumentation? With the neat block diagram, explain its functionalities.
- 1B. With the help of neat diagram, explain the working principle of Successive Approximation ADC, with its advantages. Also calculate the 4-bit Successive Approximation ADC output for the given parameters. (i.e Vref=4v, 5 Vin=3.14159v, DAC input starts from 0b0000).

1C.	Define/explain the following :		
	I). Baud rate	II). Seebeck effect	
	III). Settling time	IV). Offset voltage	2

- 2A. How does a differential Manchester code is differ from NRZs? Explain with suitable samples of signal conversion for it.3
- **2B.** List out any 4 differences between synchronous & statistical TDM ?
- 2C. Derive the expression for "Two-OpAmp Based Instrumentation amplifier" (which can be used as a signal conditioning circuit with sensors) 4 with required circuit, in detailed steps.
- **3A.** Elaborate on CAN bus standard data frame format and its utilization in data transfer.

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- 3B. Discuss about the General structure of a Telemetry system indicating the possible levels to establish the link between transmitter and receiver. Also explain why HART field communication protocol is necessary in simultaneous analog & digital communication.
- 3C. Identify the required Isolation amplifier which acts as a protective device in motor control system, explain its working principle with suitable circuit 3 connections.
- **4A.** A 8-bit R/2R ladder Digital-to-Analog (DAC) converter has a binary input of
11010010 & 10101010, one after the other for an supply voltage of 4v.**3**
Calculate the V_{out} for the above with Non-inverting amplifier and R = 25KΩ.
- 4B. Mention any 4 functional characteristics of D/A board in general And explain the working principle of n-bit weighted-current source D/A converter with its 5 circuit.
- **4C.** Identify any 2 differences between the following block diagrams of VI projected in labview, and calculate the expected outputs for the same.



- **5A.** Discuss on the advantages & disadvantages of exposed junction & isolated junction thermocouple with its structure.
- 5B. A Ramp type ADC has the following parameters: N=8, V_{ref} =5.1V and clock =2MHz. find the step size, digital word (binary output) for an V_{in} of 4.36V and the conversion time taken to reach this value.
- **5C.** Elaborate on Master transmitter & receiver frame format of I2C Bus, along with the device addressing, start & stop bit indications.
- 6A. Create a VI which converts a set of 6 continuous decimal numbers to binary numbers using for loop & arrays (indicate the conversion calculations, with front panel & block diagram in labview).
- 6B. Sketch and label the format of endpoint descriptor most widely used in USB. 2
- **6C.** Explain about the multiplexing hierarchy used in fiber Optic communication **3** with required diagram.

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