Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, DEC-2015/JAN-2016

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.

1A.	How the Ground issues affect the signal conditioning circuits, elaborate on the ground and floating signal sources with required sketches.	**3**
1B.	Derive the expression for "Two Op-Amp Based Instrumentation amplifier"(which can be used as a signal conditioning circuit with sensors) with required circuit, in detailed steps.	**5**
1C.	Draw the table of "Available Common Wires" in LABVIEW , for different data types & corresponding Scalar, 1D & 2D arrays.	**2**
2A.	Which all types of signal encoding techniques could be used after acquiring the data for the signal conversion to process through a Modem for any system? Explain in brief with example of random data conversion for each.	**3**
2B.	Does multiplexers are required in DAQ systems? suggest the best suitable Multiplexer types for the signal transmission and define why?	**2**
2C.	Mention any 4 functional characteristics of D/A board in general And explain the working principle of 4-bit R/2R ladder Digital-to-Analog (DAC) converter with its circuit and calculate the Vout for the above with the inverting amplifier for R = 12KΩ & an input of 1001 for the supply voltage 5v.	**5**
3A.	With the suitable diagram explain the working principle of Flash ADC and define how the Sparkle codes and Metastability affects the same.	**5**

3B.	Discuss on any 4 Errors predicted while data transfer through CAN bus.	**2**
3C.	A Ramp type ADC has the following parameters: N=12, Vref=3.8v and clock =1.5MHz. find the step size, digital word (binary output) for an Vin of 2.96v and the conversion time taken to reach this value.	**3**
4A.	Define Nyquist theorem. How the signals are sampled based on Nyquist theorem in PCM. Explain with an example.	**3**
4B.	Compare the Text-based programming with Graphical-based programing used for Labview, in detail.	**3**
4C.	List and explain any 4 fundamental functions that a signal conditioning equipment performs.	**4**
5A.	What is cold junction compensation? Explain its working with suitable sketches and define why it is necessary.	**4**
5B.	List out the merits & demerits of Sigma-delta modulation.	**2**
5C.	Elaborate on Master transmitter frame format of I2C Bus, along with the device addressing, start & stop bit indications.	**4**
6A.	Create a VI which forms a complex number using 2 inputs X & Y. for that complex number. find the complex conjugate & polar components in Labview block diagram.	**5**
6B.	Sketch and label the format of endpoint descriptor most widely used in USB.	**2**
6C.	Explain the following : i. Stacked shift registers ii. Structure tunnels iii. Polymorphism	**3**