

Master of Science (Instrumentation) Examination, 2018-19

2nd year, 1st Semester

SUBJECT : DATA ACQUISITION & INTERFACING

PAPER : XI (T-301)

Time : Four hours

Full Marks : 100

Use a separate answerscript for each unit.

GROUP - A

Answer any five questions, each question carries 10 Marks

1. What is electrical noise? Describe the function of a lock-in Amplifier with circuit diagram. [2+8]
2. How phase angle between two sinusoidal signals of same frequency can be detected in terms of DC output voltage by using real analog multiplier circuit with low pass filter? Show graphically the phase angle difference between two signals vs output DC voltage. [8+2]
3. Why active rectification is required for rectification of very low AC Voltage? Draw a detailed active rectifier circuit using Op-Amp, diodes and other circuit elements. [2+8]
4. Derive the transfer function of Phase Locked Loop system with it's all basic sections. [10]
5. Design a *Resistive Divider* with its high voltage and low voltage arm to measure 0-5000V DC in 0-5V range DC which draws a maximum current of 1mA from the source. Calculate the error if the measuring voltmeter (0-5V scaled in 0-5000V) draws a current of 250micro Ampere. Can we reduce the error by using an Op-Amp? If yes show the circuit configuration. [4+3+3].
6. Design with basic circuit and Algorithm a micro controller based automatic capacitor measurement bridge using transformer ratio bridge [10]
7. a. What are the basic assumptions for electrical circuit analysis ? and why these assumptions are not workable so far as EMI is concerned?
b. Show with schematic diagram with all necessary components including the DATA acquisition system of a typical anechoic screen room to test Radiated immunity of Equipment. [3+7]

[Turn over

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Group-B

Answer any five questions: (5x10=50)

1. What is multiplexing? What do you mean by multiplexer and de-multiplexer? Distinguish between synchronous and asynchronous TDM. Explain the wavelength division multiplexing. Distinguish between FDM and TDM. 1+2+2+3+2=10
2. Discuss the addressing and format of the mode control register of 8253. Explain Mode1 of 8253 with suitable timing diagrams. Write a program to initialize counter 1 in mode 3 with a count of C030 H. Assume address for control register= 0DH, counter0 =09H, counter1=08H and counter2=0AH. 4+3+3=10
3. Explain the sequence of events takes place when servicing an interrupt in 8259. Explain with a suitable diagram how the 8259 can be used in cascaded mode for master-slave operation. Explain the function of $\overline{SP}/\overline{EN}$, \overline{INTA} and INT pins of 8259. 3+4+3=10
4. Write a short note on **any one** of the following:
 - a. Sigma-Delta Convertors
 - b. The different bits of the mode set register of 8257 10
5. Explain the 8:1 de-multiplexer with proper diagram and expression. Derive the expression for Differential amplifier using one op-amp. Derive the expression for integrator. 4+3+3=10
6. Explain the working of Dual Slope Type A/D Converter with suitable logic diagram. Consider the clock frequency is 1 MHz, the reference voltage is -1.0 V, the fixed time period T_1 is 1ms and the RC time constant is set at RC=1 ms. Assuming the unknown analog input voltage amplitude as $V_i=5$ V, find the integrator output V_S for the fixed period T_1 when the output will go down and T_2 when the output will integrate all the way back to 0V. 7+3=10
7. Explain the modes of operation of 8279. What is 2 Key Lockout and N-Key rollover in scanned keyboard mode. 6+4=10