

**International Islamic University Chittagong**  
**Department of Electrical and Electronic Engineering**

Final Examination, Autumn-2018

Program: **B.Sc. Engg. (EEE)**

Course Code: **EEE- 4827**

Course Title: **Measurement and Instrumentation.**

Time: **2 hours 30 minutes**

Full Marks: **50**

**Part A**

[Answer any two questions from the followings; Figures in the right margin indicate full marks.]

- 1(a). What is the basic difference between three lead method and four lead method for measuring temperature? Describe three lead method. 04
- 1(b). Design a pressure measuring system using photoelectric transducer. What are the advantages of piezoelectric transducer for pressure measurement? 04
- 1(c). Describe the method of measuring liquid level using gamma rays. 02
- 2(a). Explain position telemetering system using necessary diagram. What are the advantages of using this system as land line telemetering system? 04
- 2(b). For amplitude modulated wave, show that the total power is,  $P_t = (1 + \frac{m^2}{2}) P_c$ . 04
- 2(c). What is the bandwidth required for an F.M signal in which the modulating frequency is 2 kHz and the maximum deviation is 10 kHz? 02
- 3(a). What are the types of flow meter? 02
- 3(b). Explain how LVDT can be used for measurement of pressure. 04
- 3(c). Write the advantages & disadvantages of Electromagnetic type flow meter. Describe how an Ultrasonic flow transducer works. 04

**Part B**

[Answer any three questions from the followings; figures in the right margin indicate full marks.]

- 4(a). Define noise and classify them. Define SNR, noise factor. 03
- 4(b). Write short note on instrumentation amplifier. Also determine  $i_o$  in the instrumentation amplifier circuit shown in Fig.1 04

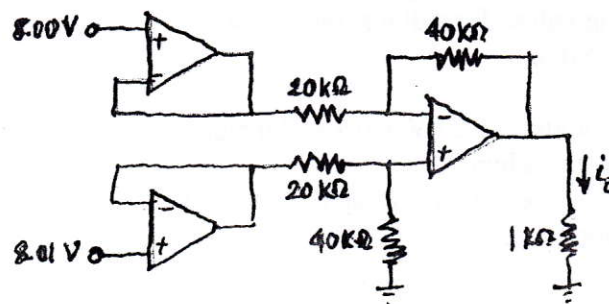


Fig.1

- 4(c). For thermal noise, show that the noise voltage is,  $V_n = \sqrt{4kTBR}$  03

- 5(a). Design a D/A converter with a resolution of 0.5% ( $k = 0.5$ ), showing the internal circuitry of the converter. Why precision reference supply is used in this type of circuit? 04
- 5(b). Define percentage resolution. What do you understand by input weight? What is the largest value of output voltage from an eight-bit DAC that produces 1.0V for an input of 00110010? 03
- 5(c). Figure Fig. 2 shows a computer controlling the speed of a motor. The 0-2 mA current DAC is amplified to produce motor speed from 0 to 1000 rpm. How many bits should be used if the computer is to be able to produce a motor speed that is within 1% of the required speed. Using smallest number of bits, how close to 200 rpm can the motor speed be adjusted? 03

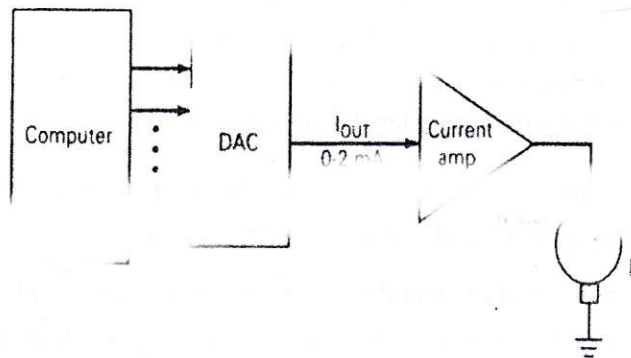


Fig.2

- 6(a). Suppose you are given an analog voltage of 1.234 V. Convert this to digital equivalent. Use successive approximation ADC to convert the analog voltage into digital. 05
- 6(b). What does the term "data acquisition" of a computer system mean? 02
- 6(c). Compare the maximum conversion times of a 10-bit digital-ramp ADC and a 10-bit successive-approximation ADC if both utilize a 500-kHz clock frequency. 03
- 7(a). Show that the gain of an instrumentation amplifier is  $A_v = (1 + 2R_1) \frac{R_2}{R_3}$  02
- 7(b). Draw and explain a digital-to-analog converter with current output. 03
- 7(c). As shown in Fig. 3, determine the following values for a digital ramp ADC: 04
- Clock frequency = 1 MHz
- $V_T = 0.1$  mV
- DAC has full scale output = 10.23 V and a 10-bit input.
- Determine the following values:
- The digital equivalent obtained for  $V_A = 3.728$  V
  - The conversion time.