

International Islamic University Chittagong
Department of Electrical and Electronic Engineering
B. Sc. Engineering in EEE

Semester End Exam, Autumn 22

Course Code: **EEE 4827**

Course Title: **Measurement and Instrumentation**

Time: 2 hours 30 minutes

Full Marks: 50

- (i) The figures in the right-hand margin indicate full marks
(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

Course Outcomes (COs), Program Outcomes (POs) and Bloom's Levels (BL) of the Questions			
CO	CO Statements	PO	BL
CO1	Reflect a basic understanding of measurement system, measuring instruments, converters, and application of instruments in measuring electrical and non-electrical quantities.	PO1	C2
CO2	Demonstrate basic proficiency in developing converters, and design measurement system for electrical and non-electrical quantities.	PO3	C3
CO3	Apply the necessary learning skills in industrial electrical and various non electrical measurements and data processing sector.	PO2	C3

Bloom's Levels (BL) of the Questions						
Letter Symbols	C1	C2	C3	C4	C5	C6
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Part A

[Answer the questions from the followings]

- | | | | |
|--|------------|-------------------|----------|
| 1. a) What is transducer? Write about primary and secondary transducers with appropriate diagram. Describe the process of using LVDT to convert pressure to displacement. | CO2 | C1,
C2 | 5 |
| 1. b) What is gauge factor? What is Poisson's ratio? A resistance wire strain gauge uses a soft iron wire of small diameter. Neglecting the piezoresistive effects, calculate the Poisson's ratio. | CO2 | C1,
C5 | 5 |
| 2. a) Design a temperature measurement system using wheatstone bridge & three-lead method. | CO2 | C5 | 4 |
| 2. b) i. Design a liquid level measurement system using capacitance method. | CO2 | C6 | 4 |
| ii. What are the basic requirement for a material to be used in temperature measurement system? | | C3 | 2 |
| Or, | | | |
| 2. a) Describe the inductive method of measuring liquid level. Compare the usability, benefits, and effectiveness of this method against the capacitive method. | CO2 | C4 | 5 |
| 2. b) Develop a system that measures fluid flow rate using ultrasonic method. Mention the advantages of this method. | CO2 | C3 | 5 |

Part B

[Answer the questions from the followings]

- | | | | |
|---|------------|-----------|----------|
| 3. a) Show that the total power in the amplitude modulated wave is, $P_t = P_c * (1 + m^2/2)$ | CO3 | C4 | 4 |
| 3. b) i. What is telemetry? Explain the block diagram of a telemetry system and classify telemetry methods. | CO3 | C2 | 3 |
| ii. Explain voltage telemetry system. | CO3 | C4 | 3 |

4. a) What is pink noise? How many different sorts of noise are there? A signal with 100kw power has a noise of 0.8kw. It is amplified with an amplifier having an amplification factor of 15 and 0.55kw of its own noise. Calculate the noise factor. 5
- CO3 C1, C4
4. b) Identify the following op-amp circuit (Fig:01). Show that the final gain of the circuit is, $A_v = (R_2 / R_1) (1 + 2R_3 / R_4)$ 5

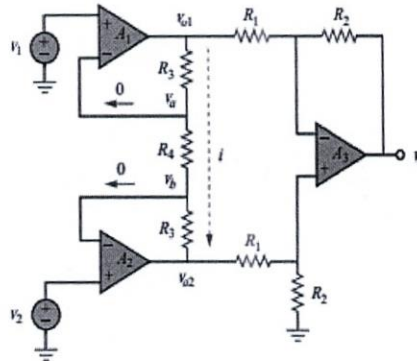


Fig: 01

5. a) Design a digital-ramp Analog-to-digital converter. CO3 C6 4
5. b) i. What are the advantages of successive-approximation Analog-to-digital converter over digital-ramp Analog-to-digital converter? CO3 C2 3
- ii. An eight-bit successive-approximation ADC has a resolution of 20mV. What will its digital output be for an analog input of 2.17 V? C3 3
- Or,
5. a) What is weighted input? An 8-bit D/A converter produces $V_{OUT} = 2.5V$ for a digital input of 00000101. Using only input weight and weighted sum method, find the value of V_{OUT} for an input of 10111010. CO2 C1, C3 5
5. b) Mention a few circumstances in which an analog-to-digital converter is used. A computer-controlled motor is using a DAC with current output. The current output is varied from 0 mA to 2 mA while the motor runs 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 10 rpm of the desired speed? CO2 C3 5