TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2082 Kartik**

| Exam. | Back (New Course) | | |
|---|---|---|---|
| Level | BE | Full Marks | 60 |
| Programme | BEL | Pass Marks | 24 |
| Year / Part | II / I | Time | 3 hrs. |

***Subject:*** - Instrumentation and Measurement (*ENEE 201*)

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*



1. Differentiate between analog and digital systems. Why digital instruments are becoming more popular nowadays? [4]
2. Define errors in a measurement system. Explain different types of errors in measurement system along with their corrective measures. [6]
3. Explain how capacitance is measured with the help of Hay's bridge. [4]
4. Explain how magnitude and direction of displacement can be measured with the help of an inductive sensor. [6]
5. A Barium Titanite Pick-up has the dimensions of 5 mm × 5 mm × 1.25 mm. The force acting upon it is 5 N. The charge sensitivity of it is 150 pC/N and its permittivity is $12.5 \times 10^{-9}$ F/m. If the modulus of elasticity of it is $12 \times 10^{6}$ N/m$^2$, calculate the strain. Also calculate the charge and the capacitance. [4]
6. Explain how the fluid flow can be measured by using Hot Wire Anemometers. [4]
7. What are the characteristics of an ideal Op-amp? State the features of an Instrumentation Amplifier and derive the expression for its Gain. [8]
8. What are the drawbacks of weighted resistor network DAC? Which DAC is used to overcome these drawbacks? Explain its operation with a suitable diagram. [8]
9. Explain the operation of sample and hold circuit. Also explain aperture time and acquisition time of the circuit. [8]
10. Show how high current and high voltage can be measured with the help of instrument transformers. [8]

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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2081 Chaitra**

| Exam. | Regular (New Course) | | |
|---|---|---|---|
| Level | BE | Full Marks | 60 |
| Programme | BEL | Pass Marks | 24 |
| Year / Part | II / I | Time | 3 hrs. |

***Subject:*** - Instrumentation and Measurement (*ENEE 201*)

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *Attempt **All** questions.*
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- ✓ *Assume suitable data if necessary.*



1. What do you understand by an instrumentation system? Explain the function of each of its components with an example. [4]
2. A voltmeter whose accuracy is 2% of the full scale reading is used on its 0-100V scale. It is used to measure a voltage of 30V and 63V. Calculate the possible error of both readings. Comment on your answer. [4]
3. An AC bridge circuit is working at 1000Hz. Arm AB has 0.2 μF pure capacitance, arm BC has 500 Ω resistance, arm CD contains an unknown impedance and arm DA has 300 Ω resistance in parallel with 0.1 μF capacitor. Find the constant of arm CD considering it as a series circuit. [6]
4. Prove that linearity and sensitivity are two conflicting requirements of a potentiometer. [4]
5. Explain the working of a capacitive transducer for liquid level measurement. [4]
6. What is piezoelectric transducer? Define the voltage sensitivity and charge sensitivity. Give the equivalent circuit for piezoelectric transducer. Derive the expression for the output voltage by making suitable assumptions. [6]
7. Explain the features of an instrumentation amplifier and derive the expression for its gain. [6]
8. Explain the working and application of op-amp as: [6]
   i) An integrator
   ii) Subtractor
9. Describe how digital to analog conversion is achieved by using the R-2R Ladder network. [4]
10. What do you understand by sample and Hold circuit? Explain the role of multiplexer in a data acquisition system with a neat sketch. [6]
11. State and explain sampling theorem. [4]
12. Explain the working principle of dynamometer type wattmeter and also prove that the deflection torque is directly proportion to power consumed by the load in both AC and DC circuit. [6]

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