

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2083 Baishakh

Exam.	Back (New Course)		
Level	BE	Full Marks	60
Programme	BEI, BCT	Pass Marks	24
Year / Part	II / II	Time	3 hrs.

Subject: - Instrumentation (ENEE 252)

- ✓ 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. What are the factor consideration while selecting a processor? [3]
2. a) Define sensitivity with example. [2]
- b) Derive the expression for resistance using the ammeter-voltmeter method. Interpret the results of the ammeter-voltmeter method for measuring medium resistance. Discuss the impact of the internal resistance of the ammeter and voltmeter on the measured value of resistance. [4]
3. a) A rotary potentiometer has a total resistance of 5 k Ω , a total angular displacement of 300°. If the wiper is at 120° and applied voltage is 10 V, what is the resistance between the wiper and the starting end? Also find output voltage. [4]
- b) Define a chemical sensor and describe its simple working principle with an example. [4]
4. a) What are the operation modes of 8255? Explain their format with suitable example. [1+4]
- b) Explain the internal architecture of STM32 Cortex M4 single core processor. [5]
- c) Explain interfacing of DC motor with AT Mega 328P microcontroller along with its circuit diagram and program. [5]
5. What are the major considerations while choosing right connectivity in instrumentation system? Explain SPI protocol with communication design of master slave configuration. [2+4]
6. Write about the factors we should consider while doing component placement. Explain with relevant diagram how inductive noise coupling mechanism can be minimized. [1+3]
7. a) Draw and list out the steps for prototype SDLC. [3]
- b) Define coupling and cohesion concepts in software engineering. [3]
8. Explain the working principle of induction type motor with derivation. [6]
9. Explain the importance of cloud in instrumentation system. [3]
10. Why are autonomous systems considered more efficient than traditional manual systems in industrial operations? Explain its technical view. [3]

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2082 Bhadra

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Level	BE	Full Marks	60
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Year / Part	II / II	Time	3 hrs.

Subject: - Instrumentation (ENEX 252)

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- ✓ Attempt All questions.
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1. Explain closed loop microprocessor based instrumentation system with useful example. [3]
2. a) Define errors and list out its types. [2+4]
- b) Analyze the significance of accuracy vs. precision in different measurement scenarios. Can you have high precision but poor accuracy? Illustrate with an example.
3. a) A linear resistance potentiometer is 50 mm long and is uniformly wound with a wire of total resistance 5,000 Ω under normal condition, the slider is at the center of the potentiometer. Determine the linear displacement when the resistance of the POT as measured by a Wheatstone bridge is 1850 Ω . If it is possible to measure a minimum value of 5 Ω resistance with the above arrangement determine the resolution of the POT in mm. [4]
- b) Define an optical sensor and describe its simple working principle with an example. [4]
4. a) Explain the block diagram of mode 1 input configuration and also write its control word and status word. [5]
- b) Draw the general block diagram of Atmega328 (AVR) CPU microcontroller. Briefly explain its features. [5]
- c) How can interface temperature sensor using I2C protocol with Atmega328 microcontroller? Explain with circuit diagram and program. [5]
5. What do you mean by WSN and how it is different from traditional sensors? Explain protocol stack diagram of ZIGBEE. [3+3]
6. Write an importance of decoupling, ground bounce, cross talk and impedance matching in designing circuit. [4]
7. List out the steps for Software development life cycle. Explain how prototype software development model is different from waterfall model. [2+4]
8. Explain the working principle of Electrodynamometer type wattmeter with its mathematical expression of deflection for both AC and DC operations. [6]
9. Explain the structural block diagram of smart sensor. [3]
10. Define Industrial 4.0. What might be the challenges to implement automation system in industrial instrumentation system? [1+2]
