Experiment No._07

Title: Virtual Lab on IoT

SOMAIYA
VIDYAVIHAR UNIVERSITY
K J Somaiya College of Engineering

Batch: B–1 **Roll No.: 16010422234** **Experiment No.:07**

Aim: Virtual Lab on IoT

Resources needed: Internet

Theory:

Virtual Labs project is an initiative of Ministry of Human Resource Development (MHRD), Government of India under the aegis of National Mission on Education through Information and Communication Technology (NMEICT). This project is a consortium activity of twelve participating institutes and IIT Delhi is a coordinating institute. It is a paradigm shift in ICT-based education. For the first time, such an initiative has been taken-up in remote-experimentation. Under the Virtual Labs project, over 100 Virtual Labs consisting of approximately 700+ web-enabled experiments were designed for remote-operation and viewing.

Activity:

Select any experiment of IoT / Embedded system from the given list of experiments on Virtual lab website.

https://sl-coep.vlabs.ac.in/exp/temperature-sensor/simulation.html

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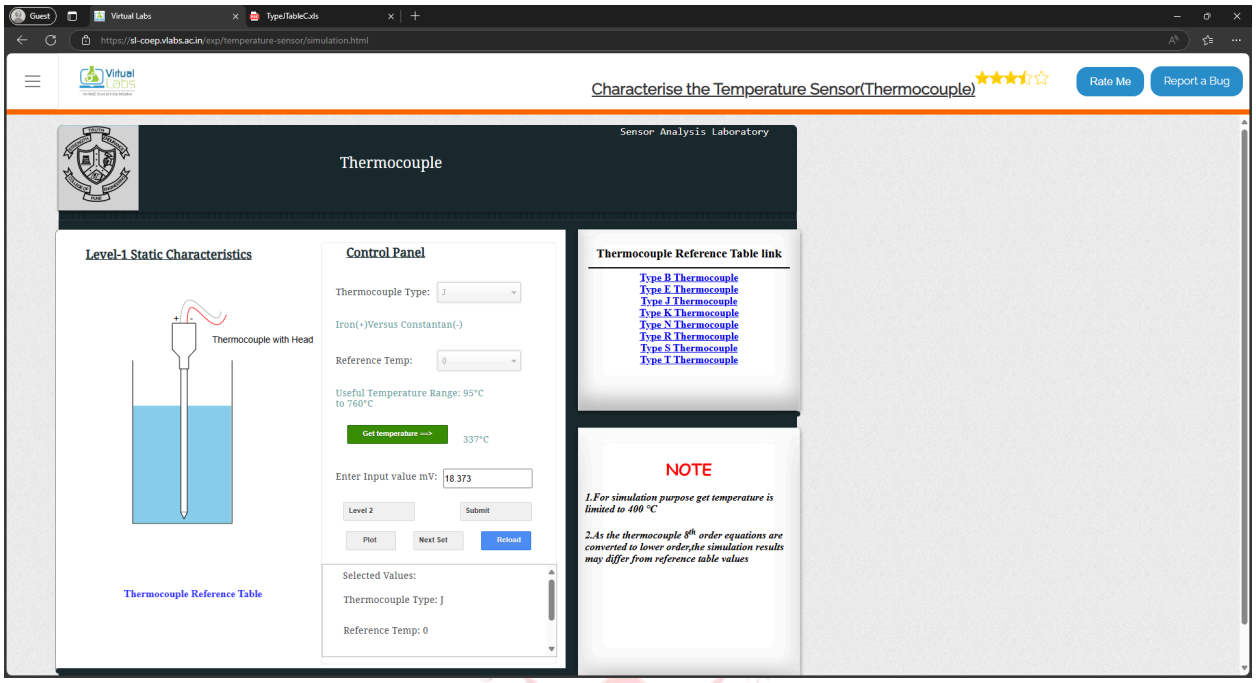
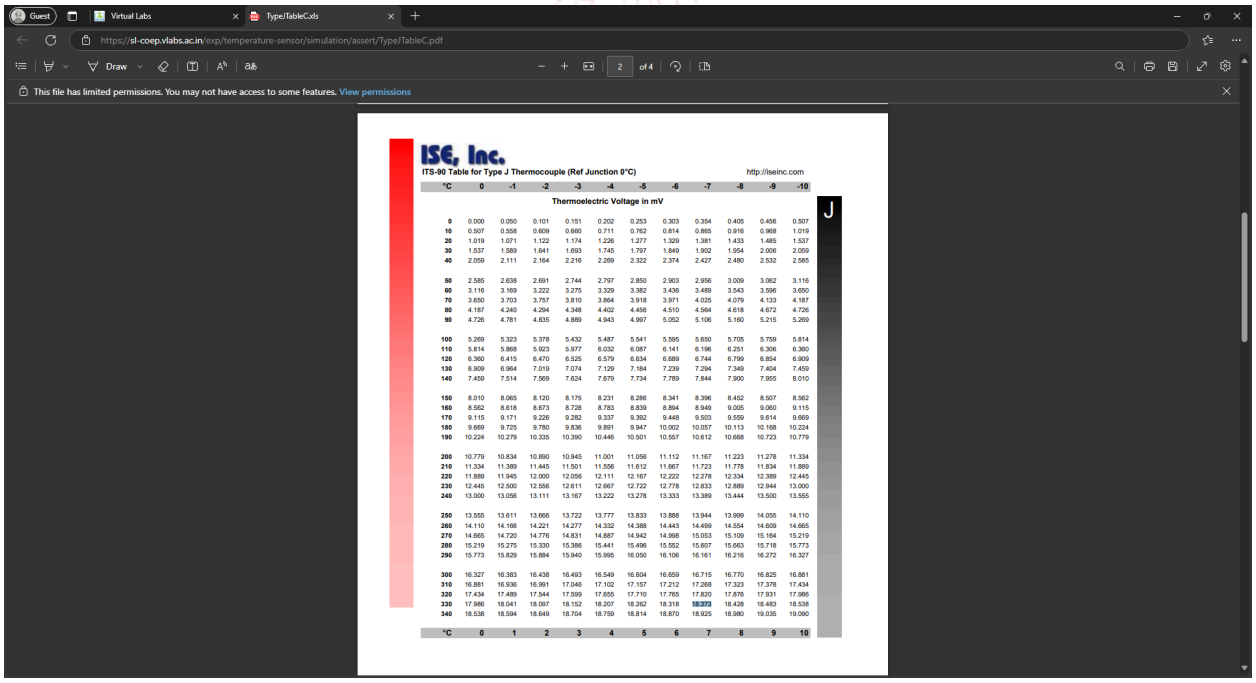
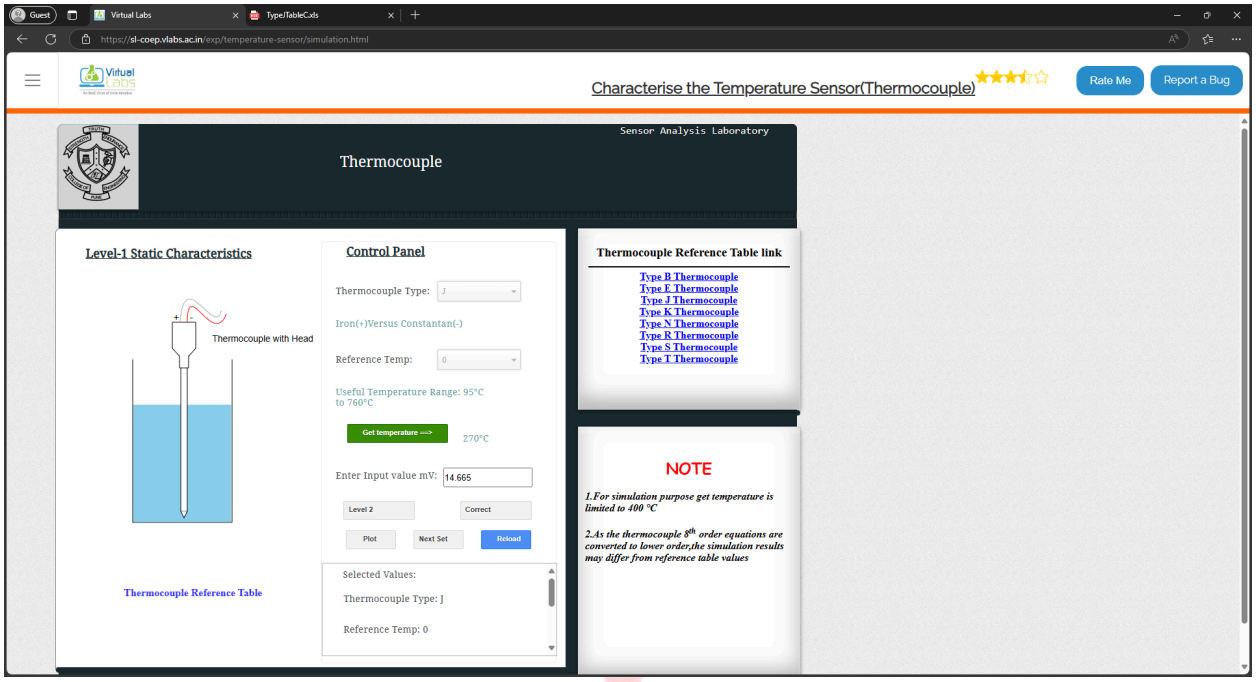
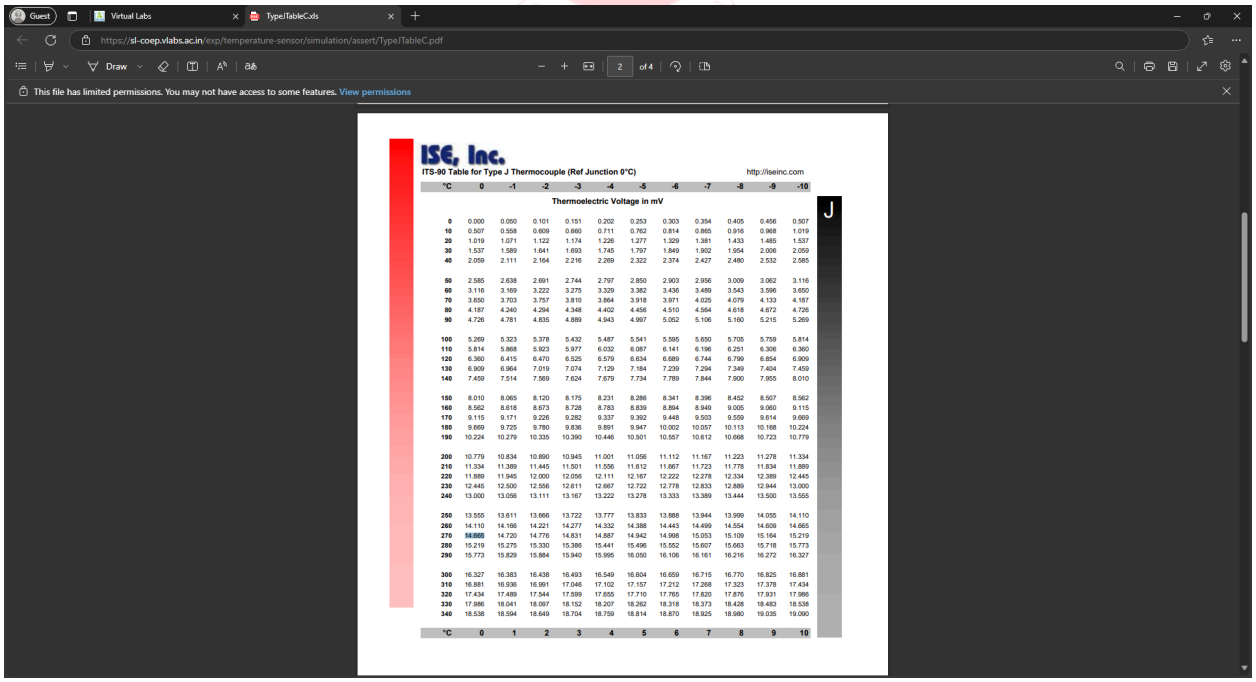
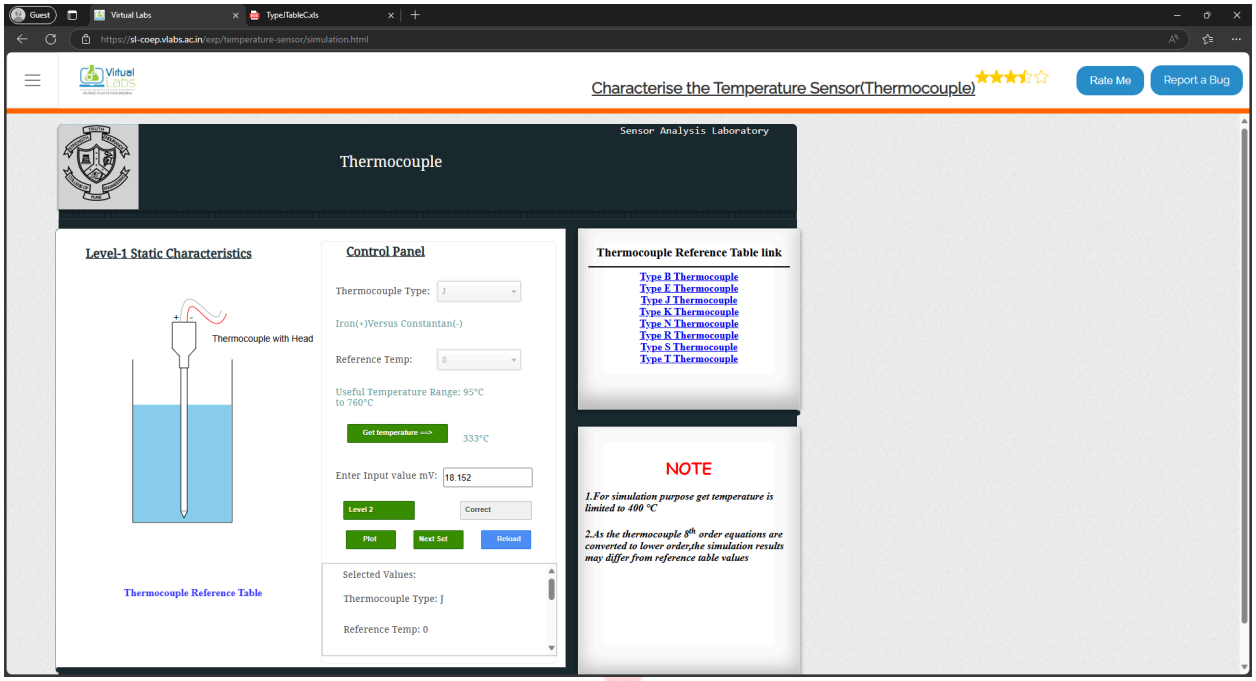
Results: (Program printout with output / Document printout as per the format)

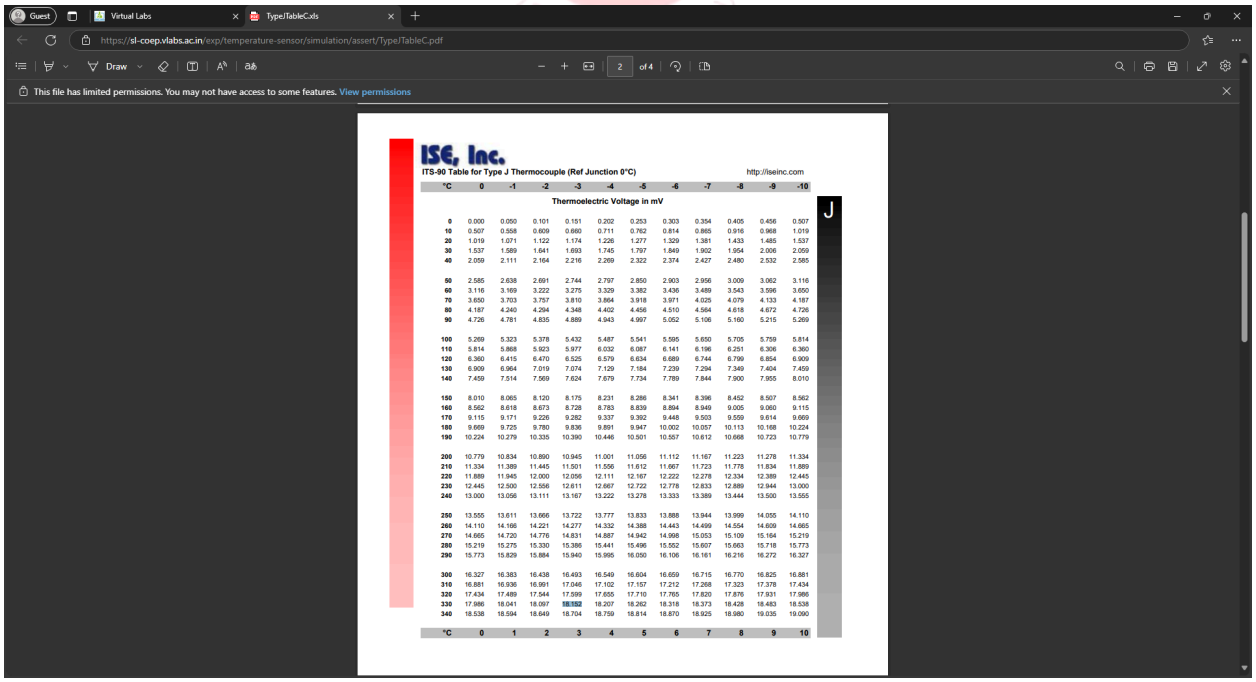





Characterise the Temperature Sensor(Thermocouple)
Rate Me
Report a Bug
Sensor Analysis Laboratory
Thermocouple
Level-1 Static Characteristics
Thermocouple with Head
Thermocouple Reference Table
Control Panel
Thermocouple Type: J
Iron(+)Versus Constantan(-)
Reference Temp: 0
Useful Temperature Range: 95°C to 760°C
Get temperature ===>
270°C
Enter Input value mV: 14.665
Level 2
Correct
Plot
Next Set
Reload
Selected Values:
Thermocouple Type: J
Reference Temp: 0
Thermocouple Reference Table link
Type B Thermocouple
Type E Thermocouple
Type J Thermocouple
Type K Thermocouple
Type N Thermocouple
Type R Thermocouple
Type S Thermocouple
Type T Thermocouple
NOTE
1.For simulation purpose get temperature is limited to 400 °C
2.As the thermocouple 8th order equations are converted to lower order,the simulation results may differ from reference table values


This file has limited permissions. You may not have access to some features. View permissions
ISE, Inc.
ITS-90 Table for Type J Thermocouple (Ref Junction 0°C)
http://iseinc.com
Thermoelectric Voltage in mV
J


Virtual Labs
TypeJTableCxls
https://sl-coep.vlabs.ac.in/exp/temperature-sensor/simulation.html
Characterise the Temperature Sensor(Thermocouple)
Rate Me
Report a Bug
Sensor Analysis Laboratory
Thermocouple
Level-1 Static Characteristics
Thermocouple with Head
Thermocouple Reference Table
Control Panel
Thermocouple Type: J
Iron(+)Versus Constantan(-)
Reference Temp: 0
Useful Temperature Range: 95°C to 760°C
Get temperature ===>
333°C
Enter Input value mV: 18.152
Level 2
Correct
Plot
Next Set
Reload
Selected Values:
Thermocouple Type: J
Reference Temp: 0
Thermocouple Reference Table link
Type B Thermocouple
Type E Thermocouple
Type J Thermocouple
Type K Thermocouple
Type N Thermocouple
Type R Thermocouple
Type S Thermocouple
Type T Thermocouple
NOTE
1.For simulation purpose get temperature is limited to 400 °C
2.As the thermocouple 8th order equations are converted to lower order,the simulation results may differ from reference table values


Virtual Labs
TypeJTableCxls
https://sl-coep.vlabs.ac.in/exp/temperature-sensor/simulation/assert/TypeJTableC.pdf
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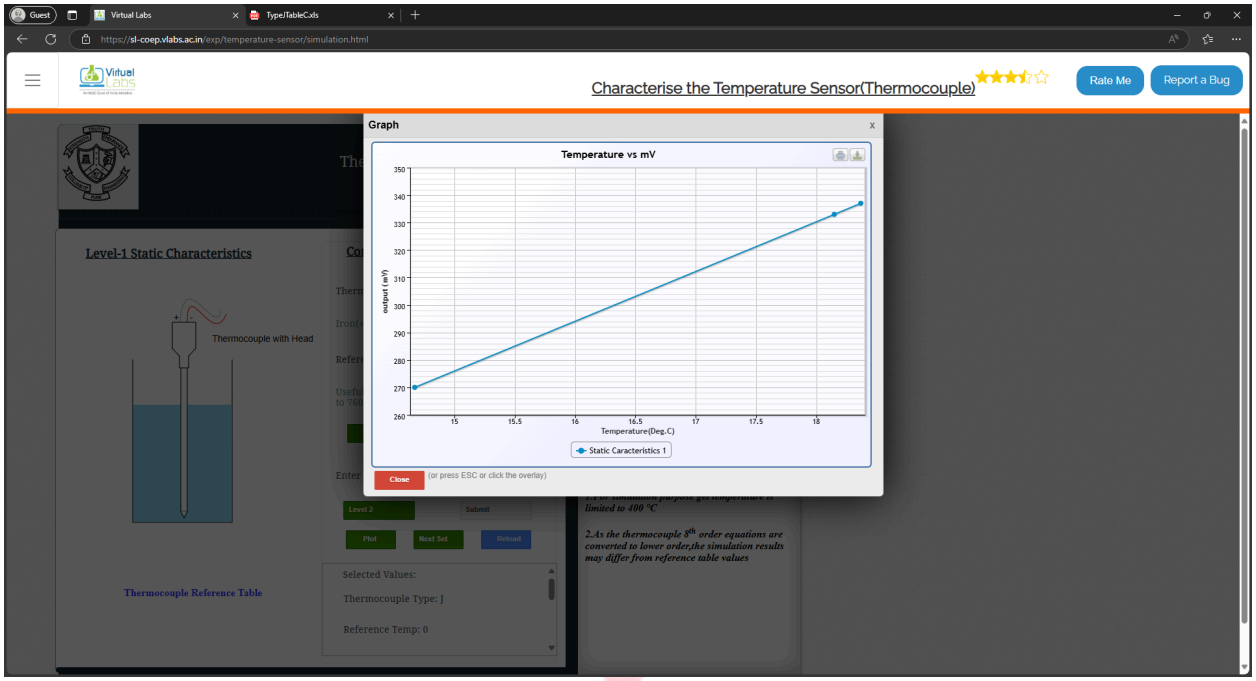
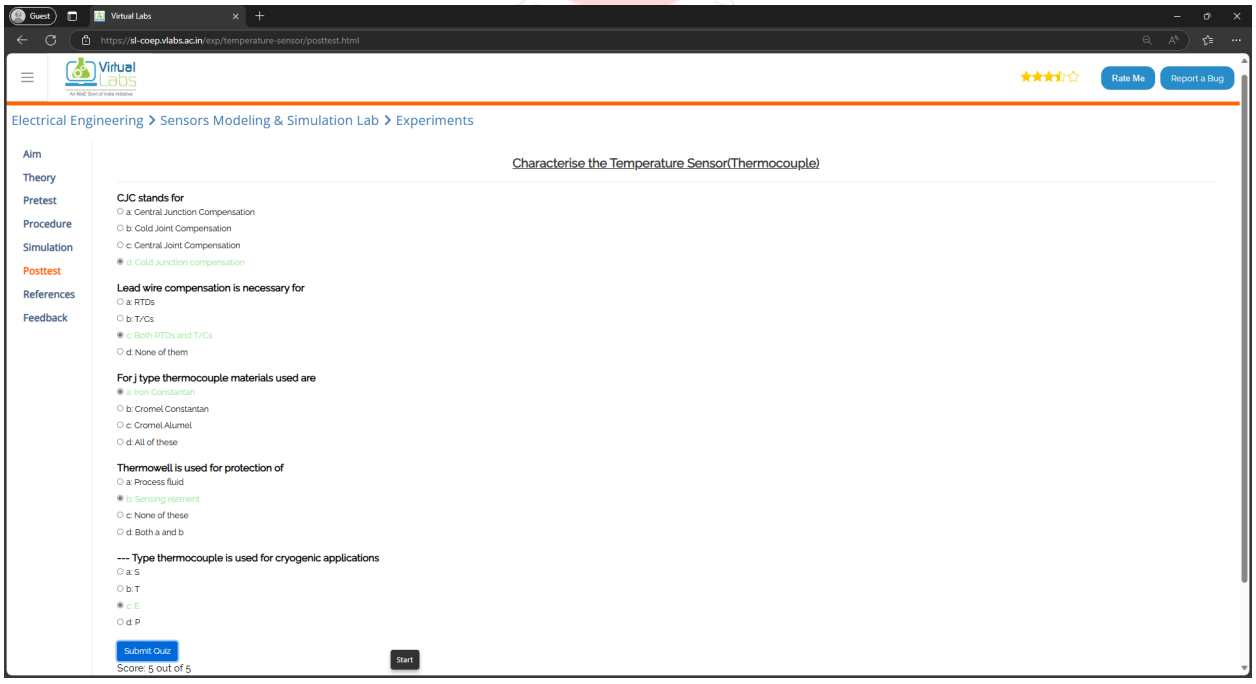
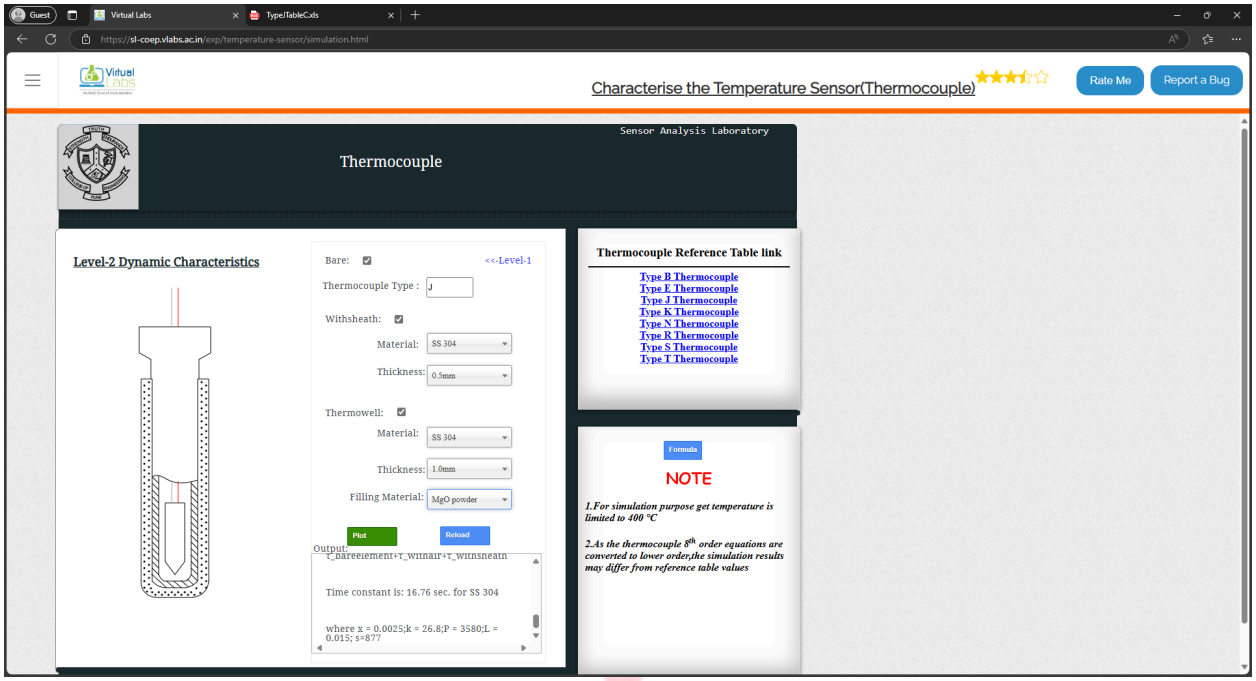
ISE, Inc.
ITS-90 Table for Type J Thermocouple (Ref Junction 0°C)
http://iseinc.com
Thermoelectric Voltage in mV
J


Characterise the Temperature Sensor(Thermocouple)
Rate Me
Report a Bug
Graph
Temperature vs mV
output (mV)
Temperature(Deg.C)
Static Caracteristics 1
Close
(or press ESC or click the overlay)
Level-1 Static Characteristics
Thermocouple with Head
Thermocouple Reference Table
Selected Values:
Thermocouple Type: J
Reference Temp: 0
2.As the thermocouple 8th order equations are converted to lower order,the simulation results may differ from reference table values


Electrical Engineering > Sensors Modeling & Simulation Lab > Experiments
Aim
Theory
Pretest
Procedure
Simulation
Posttest
References
Feedback
Characterise the Temperature Sensor(Thermocouple)
CJC stands for
a: Central Junction Compensation
b: Cold Joint Compensation
c: Central Joint Compensation
d: Cold Junction compensation
Lead wire compensation is necessary for
a: RTDs
b: T/Cs
c: Both RTDs and T/Cs
d: None of them
For j type thermocouple materials used are
a: Iron Constantan
b: Cromel Constantan
c: Cromel Alumel
d: All of these
Thermowell is used for protection of
a: Process fluid
b: Sensing element
c: None of these
d: Both a and b
--- Type thermocouple is used for cryogenic applications
a: S
b: T
c: E
d: P
Submit Quiz
Score: 5 out of 5
Start


Characterise the Temperature Sensor(Thermocouple)
Rate Me
Report a Bug
Sensor Analysis Laboratory
Thermocouple
Level-2 Dynamic Characteristics
Bare:
<<-Level-1
Thermocouple Type :
J
Withsheath:
Material:
SS 304
Thickness:
0.5mm
Thermowell:
Material:
SS 304
Thickness:
1.0mm
Filling Material:
MgO powder
Plot
Reload
Output:
Time constant is: 16.76 sec. for SS 304
where x = 0.0025;k = 26.8;P = 3580;L = 0.015; s=877
Thermocouple Reference Table link
Type B Thermocouple
Type E Thermocouple
Type J Thermocouple
Type K Thermocouple
Type N Thermocouple
Type R Thermocouple
Type S Thermocouple
Type T Thermocouple
Formula
NOTE
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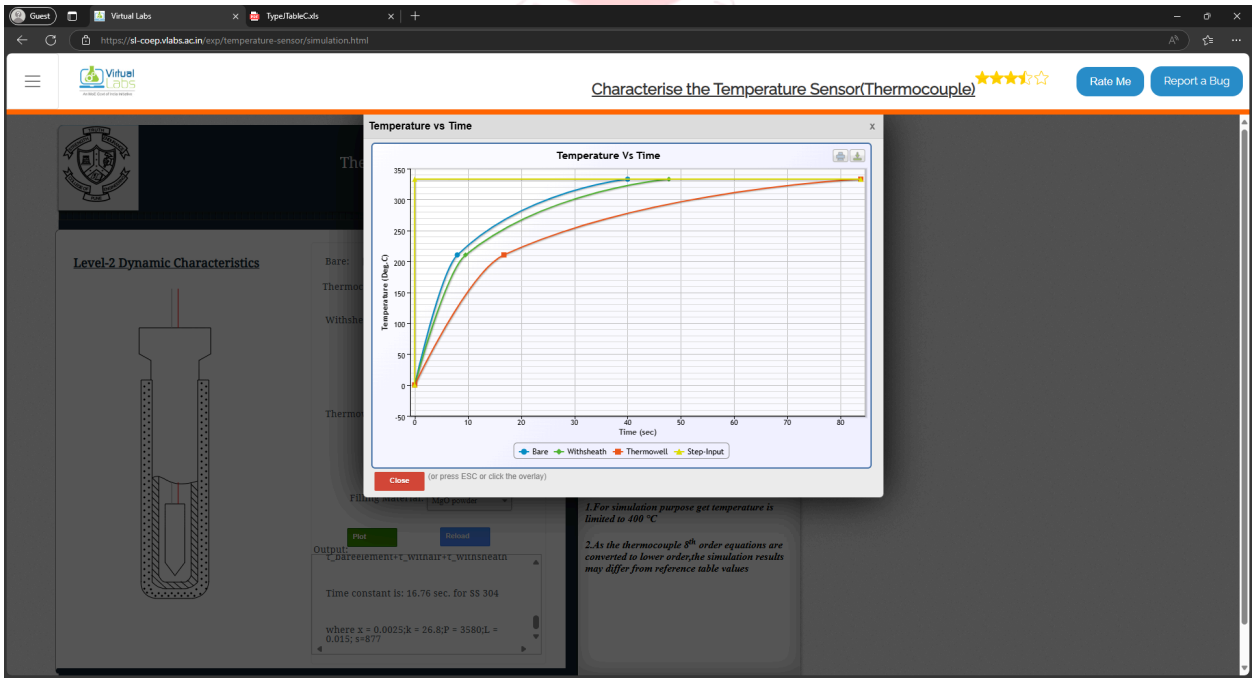
Characterise the Temperature Sensor(Thermocouple)
Rate Me
Report a Bug
Temperature vs Time
Temperature Vs Time
Temperature (Deg.C)
Time (sec)
Bare
Withsheath
Thermowell
Step-Input
Close
(or press ESC or click the overlay)
Level-2 Dynamic Characteristics
1.For simulation purpose get temperature is limited to 400 °C
2.As the thermocouple 8th order equations are converted to lower order,the simulation results may differ from reference table values

Questions:

1. Explain AWS IoT Greengrass concept.

AWS IoT Greengrass is a service that extends AWS cloud capabilities to local devices, allowing them to process data, execute machine learning models, and communicate securely even when offline. It enables edge devices to act intelligently by running AWS Lambda functions, synchronizing data with the cloud, and securely interacting with other devices in the network.

Key features of AWS IoT Greengrass:

i. Local Computing: Allows devices to process data locally without always depending on the cloud.

ii. Machine Learning (ML) Inference: Enables edge devices to run pre-trained ML models for faster decision-making.

iii. Secure Device Communication: Provides authentication and encryption for secure device-to-device and device-to-cloud communication.

iv. Connectivity Management: Supports intermittent connectivity by caching messages and synchronizing them with the cloud when the connection is restored.

v. Lambda Function Execution: Allows running AWS Lambda functions on local devices to automate tasks and respond to local events.

AWS IoT Greengrass is widely used in industries like smart homes, industrial automation, and healthcare to improve efficiency and reduce latency in IoT applications.

Outcomes: CO2 — Comprehend IoT architecture, enabling technologies and protocols

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Conclusion:

In this experiment, we explored the concept of Virtual Labs and how they enable remote experimentation in IoT. The selected experiment demonstrated the functionality of a temperature sensor using a virtual simulation. The use of Virtual Labs enhances learning by providing hands-on experience without requiring physical hardware. Additionally, we learned about AWS IoT Greengrass and its role in enabling edge computing for IoT devices, allowing them to process data locally while maintaining secure communication with the cloud. This knowledge is essential for developing efficient and scalable IoT applications.

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of faculty in-charge with date

References:

Links:

https://www.vlab.co.in/

Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.

2. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT, 2014.

3. Dr. Ovidiu Vermesan, Dr. Peter Friess, “Internet of Things - From Research and Innovation to Market Deployment”, River Publisher, 2014

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