Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY 2025

Date: 24-05-2025 **Time:** 09:30 am – 12:30 pm

School: SOCSE	**Program:** B. Tech - CAI\CBC\CBD\CCS\CDV\CIT\COM\CSD \CSE\CSG\ISE\IST	
Course Code : EEE1006	**Course Name:** Smart Sensors for Engineering Applications	
Semester: VI	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**
Marks	**20**	**20**	**40**	**20**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

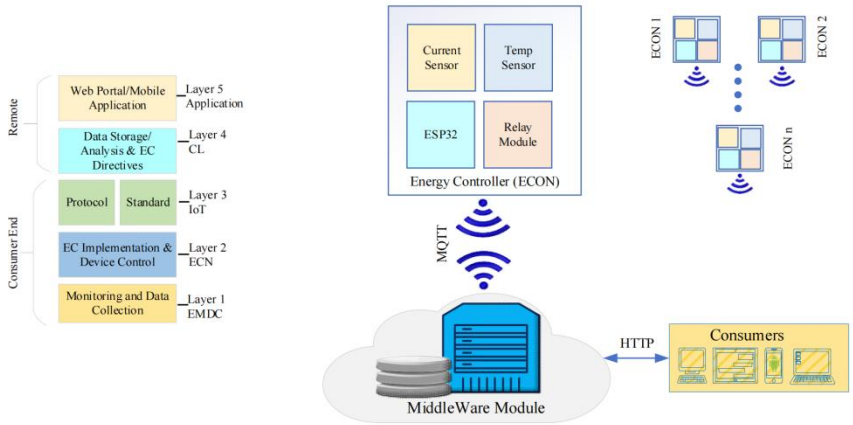
1.	List the various classification of sensors	**2 Marks**	**L1**	**CO1**
2.	Recall the basic principle of operation of a resistive transducer.	**2 Marks**	**L1**	**CO1**
3.	What is the difference between active and passive transducers	**2 Marks**	**L1**	**CO1**
4.	What is the working principle of a inductive transducer?	**2 Marks**	**L1**	**CO1**
5.	What is the significance of precision in a transducer?.	**2 Marks**	**L1**	**CO1**
6.	Recite the basic principle of operation of a inductive transducer.	**2 Marks**	**L1**	**CO1**
7.	Define a transducer.	**2 Marks**	**L1**	**CO1**
8.	What is the difference between active and passive transducers	**2 Marks**	**L1**	**CO1**
9.	Recall the concept of a closed loop control system	**2 Marks**	**L1**	**CO1**
10.	List the two main classifications of transducers.	**2 Marks**	**L1**	**CO1**

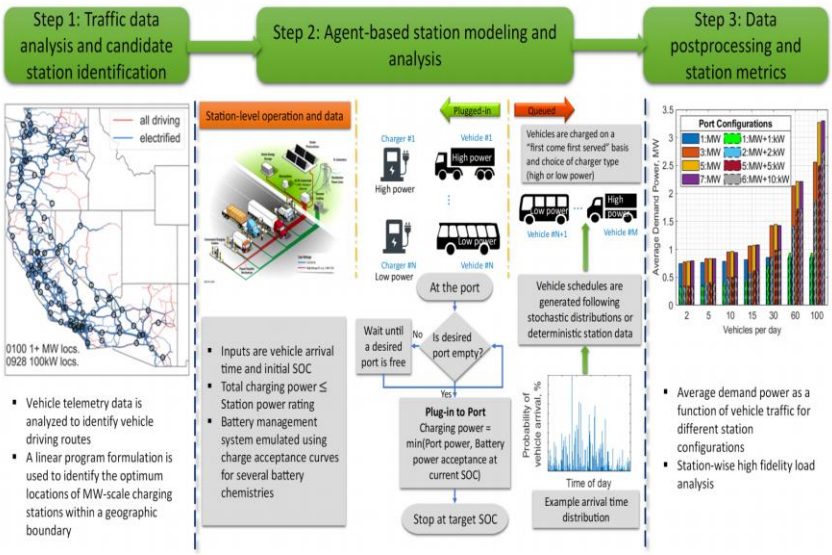
Part B

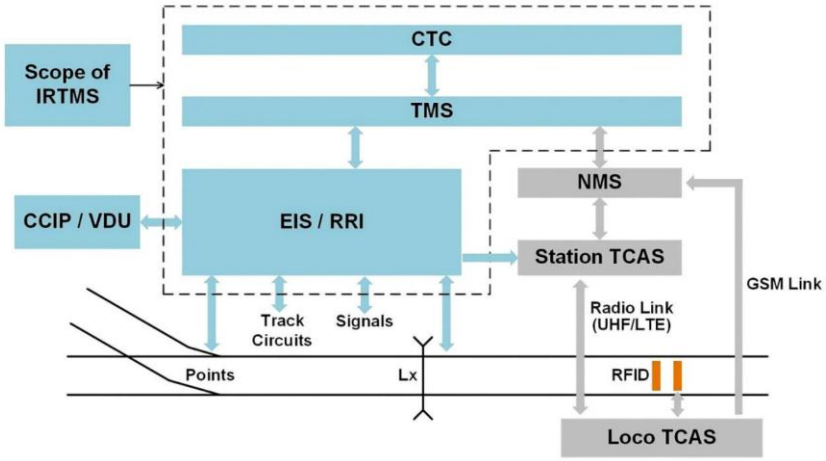
Answer the Questions. **Total Marks 80M**

11.	**a.**	Mr. Rahul Sharma, a municipal officer in Delhi, was facing challenges in managing waste collection efficiently. The waste collection trucks often traveled fixed routes without knowing the actual waste levels in bins, leading to overflow in some areas and unnecessary fuel consumption in others. To optimize the process, the municipality decided to implement an IoT-based smart waste management system using various sensors. Explain the working of such a system, identifying the most suitable sensors for detecting waste levels, monitoring air quality, and optimizing waste collection routes. Also, Put Contrast on how cloud-based analytics can enhance operational efficiency.	**10 Marks**	**L2**	**CO2**
	b.	ABC Electronics Ltd., a company producing circuit boards, generates large quantities of electronic waste (e-waste). Improper disposal of e-waste can lead to environmental hazards due to toxic materials. The management decided to implement an IoT-based waste monitoring system using smart bins and gas sensors to ensure compliance with environmental regulations. Put contrast on how IoT sensors can be used to monitor e-waste disposal in real-time. Suggest a suitable sensor network and cloud platform for data storage, and explain how this system can help industries meet sustainability goals.	**10 Marks**	**L2**	**CO2**
		Or			
12.	**a.**	In a large municipal waste dump site, workers started complaining of dizziness and breathing issues. An environmental agency was called in, and it was suspected that hazardous gases like methane and hydrogen sulfide were being released due to waste decomposition. To ensure worker safety and environmental compliance, the agency decided to install IoT-based gas sensors. Illustrate the working principle of gas sensors such as MQ-135 and electrochemical sensors in detecting harmful gases in waste dumps. Summarize how can IoT technology send early warnings and help authorities take preventive measures?	**10 Marks**	**L2**	**CO2**
	b.	Presidency University planned to implement a smart waste management system across its campus to reduce waste overflow and promote sustainability. They installed IoT-based waste bins with fill-level sensors and cloud-based dashboards to track waste accumulation in different departments. Explain how predictive analytics and IoT-based waste tracking can improve waste collection efficiency in a university. Put Contrast on how machine learning algorithms can forecast peak waste generation times and optimize waste collection schedules.	**10 Marks**	**L2**	**CO2**

13.	**a.**	A municipal corporation is planning to replace traditional water meters with smart meters to ensure accurate billing and water conservation.Explain the general architecture of a smart water meter, highlighting its main components. How does telemetry	**10 Marks**	**L2**	**CO3**

		help in automatic data collection and reporting in this context? Illustrate with a basic block diagram.			
	b.	An agricultural farm faces issues with under- and over-irrigation. To solve this, the farm owner installs soil moisture sensors integrated with a smart irrigation system. Illustrate the working of smart soil moisture sensors and identify the major components involved. How can telemetry technology enable remote monitoring and automatic control of irrigation schedules? Support your explanation with a suitable flowchart.	**10 Marks**	**L2**	**CO3**
		Or			
14.	**a.**	An energy service company implements telemetry solutions in a manufacturing plant to monitor machinery power consumption and improve operational efficiency. Infer how telemetry-based real-time monitoring can help detect abnormal energy usage and reduce energy costs in the plant. How can integration with mobile applications for instant alerts and consumption reporting improve decision-making for energy managers? Compare the telemetry-based system with traditional energy audit methods.  	**10 Marks**	**L2**	**CO3**
	b.	A company developing autonomous electric cars wants to ensure real-time health monitoring of battery systems during operation by using telemetry.Explain how telemetry systems are used for monitoring battery status (such as State of Charge and State of Health) in autonomous electric cars. How does continuous data transmission improve the performance and safety of these vehicles? Illustrate your explanation with a simple telemetry block diagram.	**10 Marks**	**L2**	**CO3**

15.	**a.**	A mobile-based application is being developed to provide railway supervisors with real-time updates on the functioning and health of KAVACH telemetry modules across multiple trains. Model the process of integrating KAVACH telemetry data with a mobile dashboard can support predictive maintenance and faster response to system faults. How does this improve decision-making for railway safety management teams compared to conventional inspection methods? 	**10 Marks**	**L3**	**CO3**
	b.	A hospital deploys wearable health bands equipped with biosensors to monitor the heart rate and oxygen levels of post-operative patients. The system uses wireless telemetry to transmit patient vitals to a central monitoring station. Explain the working of biosensors in wearable health bands and how telemetry enables real-time data transmission to the medical team. How does this setup improve patient monitoring compared to periodic manual checks?	**10 Marks**	**L2**	**CO3**
		Or			
16.	**a.**	An airline implements a real-time aircraft health monitoring system that uses various sensors to track engine performance, fuel usage, and environmental conditions during flight. Explain how onboard sensors in aircrafts collect critical data during	**10 Marks**	**L2**	**CO3**

		flight and how telemetry systems transmit this data to ground stations. What are the advantages of using such telemetry-based systems over manual post-flight diagnostics?			
	b.	A mobile-based application is being developed to provide railway supervisors with real-time updates on the functioning and health of KAVACH telemetry modules across multiple trains. Identify how integrating KAVACH telemetry data with a mobile dashboard can support predictive maintenance and faster response to system faults. How does this improve decision-making for railway safety management teams compared to conventional inspection methods?	**10 Marks**	**L3**	**CO3**

17.	**a.**	A start-up develops a home-based diagnostic device that collects body temperature, ECG, and blood pressure data and uploads it to the cloud for analysis by doctors. Explain how telemetry supports remote diagnostics in home-based health monitoring systems. What types of medical data are commonly transmitted, and how does cloud integration assist healthcare providers in making timely decisions?	**10 Marks**	**L2**	**CO4**
	b.	A leading EV manufacturer installs battery management systems (BMS) in its electric cars to monitor battery temperature, voltage, and charge cycles in real-time. Explain the role of sensors in a Battery Management System (BMS) of an electric car and how telemetry helps transmit this data to vehicle dashboards. What are the advantages of real-time battery monitoring over traditional periodic checks?	**10 Marks**	**L2**	**CO4**
		Or			
18.	**a.**	A chemical processing unit uses automation to regulate valve control and temperature through sensor-based feedback systems connected to a PLC (Programmable Logic Controller). Infer how sensors and telemetry support industrial process automation in chemical plants. What role does the PLC play in managing automated control based on real-time data? Provide examples of common process parameters monitored.	**10 Marks**	**L3**	**CO4**
	b.	An automotive assembly line adopts a smart automation system where robotic arms are monitored remotely using IoT telemetry and alert systems to prevent unexpected downtimes. Illustrate how telemetry-enabled systems can be used to monitor robotic operations in real-time. How can mobile applications integrated with this telemetry data enhance preventive maintenance and increase production efficiency? Contrast this approach with manual inspection routines.	**10 Marks**	**L3**	**CO4**