MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING
(A Unit of Rajalaxmi Education Trust®, Mangalore)
Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Model Question Paper

Sixth Semester B.E Degree Examination

System Engineering

Time: 2.5 Hours (150 Minutes) **Max. Marks: 100**

Note:* *1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M: Marks, L: RBT (Revised Bloom's Taxonomy) level, C: Course outcomes.

		Module -1	**M**	**L**	**C**
Q1	a.	Explain the importance of physical design in engineering systems and discuss any two objectives of physical design.	05	L2	CO1
	b.	Explain three elements of sensor-actuator systems	05	L2	CO1
	c.	With a neat diagram, explain the conceptual physical design architecture of a Cyber-Physical System.	10	L2	CO1
		OR			
Q2	a.	List the common types of sensors used in physical systems. Discuss the key design considerations while selecting a sensor as an input component in system engineering applications.	05	L2	CO1
	b.	Discuss the limitations and ambiguity associated with the definition of a sensor as "a device that responds to a physical stimulus and transmits a resulting signal." Illustrate your answer with a suitable example	05	L2	CO1
	c.	With detailed steps explain how I2C & SPI Communication Protocol Works	10	L2	CO1
		Module- 2			
Q3	a.	Compare RDBMS and NoSQL with respect to sensor data characteristics in Cyber-Physical Systems.	06	L3	CO2
	b.	Illustrate UNION types (categories) in EER modeling using a Smart Agriculture Cyber-Physical System example	05	L3	CO2
	c.	Design an Enhanced Entity–Relationship (EER) model for an "**automated Aircraft Monitoring & Control"** Cyber-Physical System that includes sensors, actuators, and controllers. Clearly identify the entities, attributes, and relationships. Incorporate appropriate specialization and generalization hierarchies, and specify the constraints on specialization such as disjoint/overlapping and total/partial participation. State clearly any assumptions made in your design.	09	L3	CO2
		OR			
Q4	a.	Identify any 3 functional data requirements & 3 non-functional data requirements for **"Air Quality Monitoring & Control Station"** & justify your answer.	06	L3	CO2
	b.	With an example scenario, Illustrate the need of In-Memory Database based data store & its applicability for Autonomous Military Drone Systems.	05	L3	CO2
	c.	Compare the following concepts with suitable examples, and identify the most appropriate type of data store for each case. Justify your answer. 1. Hard Real-Time Systems vs Soft Real-Time Systems 2. Push-based vs Pull-based data retrieval models	09	L3	CO2
		Module - 3			

Q5	a.	A Smart Agriculture System requires farmers to monitor soil moisture, temperature, and irrigation status in real time. With an example illustrate how UI/UX principles can be applied to design a user-friendly interface for this system.	06	L3	CO3
	b.	An industrial monitoring system needs to display machine performance and alerts. Compare operational, analytical, and strategic dashboards, and determine which type is most suitable. Justify your answer.	06	L3	CO3
	c.	With an example, illustrate the Design a dashboard for a Smart Agriculture system that supports business decision-making. Identify KPIs, layout, and business value.	08	L3	CO3
OR					
Q6	a.	Apply the concept of Hardware User Interface (HUI) to design an interface for a smart irrigation system & illustrate user interaction.	06	L3	CO3
	b.	With an example illustrate how dashboard design principles can be applied to improve a poorly designed IoT dashboard.	06	L3	CO3
	c.	Develop a value-driven dashboard for agricultural analytics. Identify KPIs, user needs, and explain UI/UX integration.	08	L3	CO3
Module - 4					
Q7	a.	An Air Quality Monitoring & Control Station experiences an increase in sensor deployments across a city. Apply the concept of scalability & illustrate how the system can handle increased data and users.	06	L3	CO4
	b.	A distributed system must ensure availability and consistency. Apply CAP theorem & with an example illustrate the trade-offs in such systems.	08	L3	CO4
	c.	Illustrate how sharding and replication is applied in scalable database architecture to improve performance and reliability of Smart Agriculture CPS.	06	L3	CO4
OR					
Q8	a.	With an example, illustrate how principles of scalable system can be applied to design a solution to improve IoT-based monitoring system performance.	06	L3	CO4
	b.	An industrial air quality monitoring system faces server overload due to continuous sensor data streams. Apply & illustrate how load balancing techniques would improve system performance.	08	L3	CO4
	c.	Illustrate various monitoring and performance tuning techniques for scalable systems with examples.	06	L3	CO4
Module - 5					
Q9	a.	A traffic congestion problem occurs at peak hours in a smart city. Illustrate how Cyber-Physical System architecture can be applied to propose a solution using sensors, communication, and control systems.	07	L3	CO4
	b.	An e-commerce platform experiences a surge in users during a festival sale. Illustrate how scalability concepts can be applied to design system to handle increased traffic, transactions, and data efficiently.	06	L3	CO4
	c.	Apply Cyber-Physical System (CPS) concepts to design the architecture of a Smart City Traffic Management System. Illustrate the working of the architecture & system with a neat diagram.	07	L3	CO4
OR					
Q10	a.	A wearable health monitoring system must track patient vitals remotely and alert doctors during emergencies. Apply CPS architecture to design a solution using sensing, communication, and actuation components & illustrate the working of system.	07	L3	CO4
	b.	Apply scalability concepts & illustrate how Netflix handles global streaming.	06	L3	CO4
	c.	Design a scalable CPS architecture for industrial monitoring including data flow, storage, and analytics & illustrate the working of the system.	07	L3	CO4

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