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Question Paper Code	13863
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Seventh Semester

Computer Science and Engineering (IoT)

20CIPW701 - SENSORS AND EMBEDDED SYSTEMS WITH LABORATORY

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. Which feature primarily distinguishes an embedded system from a general-purpose computer? (a) Larger storage capacity (b) Dedicated to a specific function (c) Supports multiple software applications simultaneously (d) Requires frequent user input	1	K1	CO1
2. Which attribute is considered essential for the reliability of embedded systems? (a) Scalability (b) Security (c) Mobility (d) Compiler speed	1	K1	CO1
3. Identify the example of a Commercial Off-The-Shelf (COTS) item used in embedded designs: (a) Custom ASIC chip (b) Pre-manufactured microcontroller board (c) Programmable logic device (d) On-chip cache memory	1	K1	CO2
4. What is the purpose of memory shadowing in embedded systems? (a) Encrypt executable code (b) Transfer code from ROM to RAM for faster execution (c) Dynamically compress memory contents (d) Extend total memory space	1	K1	CO2
5. In an RTOS environment, context switching means: (a) Modifying the system hardware setup (b) Saving a task's state and loading another's (c) Running only scheduled periodic tasks (d) Restarting the OS kernel	1	K1	CO3
6. Which scheduling method prioritizes tasks based on the shortest execution time? (a) Round Robin (b) Shortest Job First (c) Preemptive Priority (d) First Come First Serve	1	K1	CO3
7. A strain gauge sensor operates based on which physical change? (a) Resistance variation due to applied force (b) Inductance variation due to temperature (c) Capacitance change due to motion (d) Frequency shift caused by vibration	1	K1	CO4
8. What does a Hall-effect sensor measure? (a) Temperature changes (b) Strength of magnetic fields (c) Rotational speed (d) Capacitance differences	1	K1	CO4
9. Fiber optic sensors detect changes in which property? (a) Electrical capacitance (b) Light intensity or phase shift (c) Magnetic resistance (d) Piezoelectric signals	1	K1	CO5
10. For an embedded system focused on environmental sensing, the best component combination would be: (a) Processor + Strain Sensor + Analog-to-Digital Converter (b) Microcontroller + Temperature Sensor + Wireless Module (c) ASIC + Potentiometer + Display Controller (d) FPGA + Thermocouple + Memory Shadowing	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

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| 11. Define an embedded system and list two of its common examples. | 2 | K1 | CO1 |
| 12. When the first microprocessor was introduced, and why was it important for embedded systems? | 2 | K1 | CO1 |
| 13. Distinguish between general-purpose processors and domain-specific processors. | 2 | K2 | CO2 |
| 14. What are sensors and actuators? Give an example of each used in embedded systems. | 2 | K1 | CO2 |
| 15. Differentiate between a task and a thread in an operating system. | 2 | K2 | CO3 |
| 16. What is task scheduling, and why is it important in RTOS? | 2 | K1 | CO3 |
| 17. Define the term “transducer.” How does it differ from a sensor? | 2 | K1 | CO4 |
| 18. Mention two important parameters that characterize sensor performance. | 2 | K1 | CO4 |
| 19. What are electrochemical sensors? Give one application. | 2 | K1 | CO5 |
| 20. Define the term “smart sensor” and state one of its advantages. | 2 | K1 | CO5 |
| 21. List any two key design considerations for an embedded system used in aerospace applications. | 2 | K1 | CO6 |
| 22. Infer a suitable embedded system configuration for a home automation system. | 2 | K1 | CO6 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

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| 23. a) Classify the embedded systems with examples for each category. Explain how complexity and functionality influence this classification. | 11 | K2 | CO1 |
| OR | | | |
| b) Elaborate on the characteristics and quality attributes of embedded systems. How do these attributes affect system design and reliability? | 11 | K2 | CO1 |
| 24. a) Describe the architecture of a typical embedded system with a labeled block diagram and also explain the function of each component. | 11 | K2 | CO2 |
| OR | | | |
| b) Illustrate on memory organization and discuss about ROM, RAM, and memory shadowing techniques. | 11 | K2 | CO2 |
| 25. a) Explain single-tasking, multitasking, and multiprocessing systems with examples. | 11 | K2 | CO3 |
| OR | | | |
| b) Describe in detail the various task scheduling algorithms used in RTOS. Compare preemptive and non-preemptive scheduling with examples. | 11 | K2 | CO3 |
| 26. a) Explain the operating principles, construction, and applications inductive sensors. | 11 | K2 | CO4 |
| OR | | | |
| b) Outline the working principle of a synchro used for measuring angular or rotary movement. | 11 | K2 | CO4 |
| 27. a) Illustrate the process by which ionizing radiation generates electrical pulses in a Geiger-Müller tube. | 11 | K2 | CO5 |
| OR | | | |
| b) Examine how smart sensor technology has improved modern home appliances. Discuss self-calibration, energy optimization, and communication features. | 11 | K2 | CO5 |
| 28. a) Summarize medical diagnostic sensors and their role in modern healthcare systems. | 11 | K2 | CO6 |
| OR | | | |
| b) Explain a suitable embedded control system that is meant for an automobile safety application. | 11 | K2 | CO6 |