K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:I
Class:PG-I	Program:M.Tech
Branch Code:ETC	Pattern:2024
Name of Course:Embedded Product Design	Course Code:2402501
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 2 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Explain the Need of Embedded Products and briefly discuss four major Design Challenges faced by engineers while developing an embedded system.	(6)	1
Question No. 2			
2a)	Describe the features of the V-Model for hardware and software development in embedded systems. Why is it particularly suited for real-time and safety-critical applications?	(6)	2
Question No. 3			
3a)	Compare General Purpose Processors (GPP) and Custom Single-purpose Processors based on the design Trade-offs in terms of Time-to-Market and Energy Efficiency.	(8)	3
	OR		
3b)	Describe the role of Embedded Firmware Design. Explain the stages of the firmware development process from initial boot-up to application execution.	(8)	3
3c)	What is Interfacing? Explain the functional blocks required to interface an Analog-to-Digital Converter (ADC) to a microcontroller for a sensor application.	(8)	3
	OR		
3d)	Discuss the use of FPGA Design Technology in embedded systems. Under what circumstances is an FPGA a better choice for hardware design than an ASIC?	(8)	3
Question No. 4			
4a)	Explain the purpose of Formal Verification and Simulation in the Design and Verification process of an embedded system. How do they complement each other?	(8)	4
	OR		
4b)	Describe the process of Integration of the hardware and software components. Explain why this phase is often the most time-consuming in the development cycle.	(8)	4
4c)	Explain the working principle and selection criteria for an In Circuit Emulator (ICE). How does it facilitate low-level debugging of embedded processors?	(8)	4

OR

4d)	Discuss the various Areas of Technology where embedded products are extensively used (e.g., IoT, Automotive, Consumer Electronics).	(8)	4

Question No. 5

5a)	Define Reliability and Failure Analysis. Explain the Mean Time To Failure (MTTF) metric and its significance in product quality assessment.	(8)	5

OR

5b)	Describe the concept of Mechanical Packaging for an embedded product. Discuss its role in protection against environmental factors (e.g., heat, dust, vibration).	(8)	5
5c)	Explain the CAN (Controller Area Network) Protocol. Why is it the most widely adopted Communication Protocol in the automotive embedded domain?	(8)	5

OR

5d)	Select an Industrial Control System as a real-life embedded product. Discuss its key components, software modules, and any two Communication Protocols it uses for networking.	(8)	5

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