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Question Paper Code : 60581

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Sixth/Seventh/Eighth Semester

Electrical and Electronics Engineering

EE8691 — EMBEDDED SYSTEMS

(Common to : Electronics and Instrumentation Engineering/ Instrumentation and Control Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the function of a Watchdog Timer in an embedded system?
2. Give the parameters to consider for the selection of processor & memory devices.
3. Differentiate between RS232 standard and RS 485 communication protocols.
4. State the need for device drivers in embedded networking.
5. What is object oriented model in embedded systems design?
6. Mention the significance of the Data Flow Graph in embedded firmware development.
7. Distinguish between a Task, process and threads in an RTOS.
8. What is priority inversion and priority inheritance?
9. Give any four examples from real life for an ordinary task being enhanced by the application of embedded systems in last ten years.
10. Identify the role of embedded systems in an Automotive Application.

PART B — (5 × 13 = 65 marks)

11. (a) Explain in detail the Structural units in an Embedded processor with a neat block diagram.

Or

- (b) Describe the various DMA Memory management methods used in embedded environments.
12. (a) Elaborate on the Serial Peripheral Interface (SPI) and Inter Integrated Circuits I2C serial bus communication protocols with appropriate timing diagrams. (7+6)

Or

- (b) Discuss the architecture, message format, and working principle of the CAN Bus protocol in embedded networking.
13. (a) Explain the objectives and the different phases of EDLC (Embedded Product Development Life Cycle) in detail.

Or

- (b) Describe the issues in Hardware-software Co-design and explain the state machine model and Sequential Program Model. (5+4+4)
14. (a) Explain the Preemptive and non-preemptive scheduling algorithms used in Real-Time Operating Systems with suitable examples. (7+6)

Or

- (b) Discuss the various Inter process Communication synchronization techniques between processes, specifically focusing on semaphores, Mailbox, and pipes.
15. (a) Explain the embedded system architecture, components and real-time operations involved in the Case Study of a Washing Machine.

Or

- (b) Describe the hardware and software architecture for a Smart card system application and an ATM machine.

PART C — (1 × 15 = 15 marks)

16. (a) Design an RTOS-based embedded architecture for an Automotive Application (e.g., an anti-lock braking system). Specify the required tasks, assign multiprocessing/multitasking priorities, choose an appropriate scheduling algorithm, and explain how the CAN bus will handle real-time sensor data communication safety.

Or

- (b) Propose a complete hardware-software co-design model for a modern Digital camera. Analyze the memory management methods required for image processing, the synchronization between processes for capturing and saving the image and draft a state machine model representing its functional behaviour.
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THEORY OF THE EARTH

It is known that the Earth is a sphere of about 8000 miles in diameter. The surface of the Earth is covered by water, and the land is divided into continents and islands. The atmosphere is the layer of gas that surrounds the Earth, and the hydrosphere is the layer of water that covers the Earth. The lithosphere is the layer of solid rock that makes up the Earth's crust.

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