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B.Tech DEGREE EXAMINATION, NOVEMBER 2023

Fifth Semester

18AUE363T - AUTOMOTIVE EMBEDDED SYSTEMS

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	Which of the following is an example of a RISC processor architecture? (A) 8051 (B) ARM (C) Motorola 68HC11 (D) PIC	1	1	1
2.	Which I/O technique involves the CPU repeatedly checking the status of an I/O device? (A) DMA (B) Interrupt-driven I/O (C) Busy-wait I/O (D) Virtual I/O	1	1	1
3.	Which technique is used to overlap the execution of multiple instructions in a processor? (A) Pipelining (B) Caching (C) DMA (D) Interrupt-driven execution	1	1	1
4.	What is a characteristic feature of RISC instruction sets? (A) Large code size (B) Complex instructions (C) Single-cycle instructions (D) Limited register usage	1	1	1
5.	Which type of memory is used for temporary storage of data and program variables during runtime? (A) Flash Memory (B) ROM (C) EEPROM (D) RAM	1	1	2
6.	What is the purpose of memory organization in an embedded system? (A) To organize files in a file system (B) To allocate storage for variables (C) To manage different types of memory devices (D) To establish network connections	1	1	2
7.	Which component is responsible for managing the transfer of data between I/O devices and the system memory without CPU intervention? (A) Timer (B) DMA Controller (C) Interrupt Controller (D) A/D Converter	1	1	2
8.	What is the purpose of a timer in embedded systems? (A) Counting external events (B) Managing I/O devices (C) Generating interrupts (D) Monitoring system performance	1	1	2
9.	Which characteristic is crucial for an embedded programming language? (A) High-level abstraction (B) Extensive standard library (C) Large community support (D) Low-level control	1	1	3

10. What is polymorphism in the context of programming languages? 1 1 3

(A) The ability of a function to perform multiple operations based on input types
(B) The process of converting data types implicitly
(C) A type of syntax error
(D) The use of multiple processors for parallel execution

11. What is the disadvantage of using dynamic memory allocation in embedded systems? 1 1 3

(A) Improved memory utilization
(B) Increased risk of memory leaks
(C) Enhanced system stability
(D) Better real-time performance

12. What is the purpose of a debugger in the development of embedded systems software? 1 1 3

(A) To write source code
(B) To optimize program size
(C) To identify and fix errors in the code
(D) To generate machine code

13. Which type of kernel is designed to respond to events in real-time? 1 1 4

(A) Batch Kernel
(B) Real-time Kernel
(C) Time-sharing Kernel
(D) Hybrid Kernel

14. Which scheduling type assigns priorities based on the task's execution rate? 1 1 4

(A) Round-Robin Scheduling
(B) Rate-Monotonic Scheduling
(C) Earliest-Deadline First Scheduling
(D) Priority Inversion Scheduling

15. Which type of real-time operating system (RTOS) is more critical and has stricter timing requirements? 1 1 4

(A) Hard Real-time
(B) Soft Real-time
(C) RT-Linux
(D) PSOS

16. Which type of I/O operation is characterized by the process being blocked until the operation is complete? 1 1 4

(A) Synchronous I/O
(B) Asynchronous I/O
(C) Interrupt-driven I/O
(D) Real-time I/O

17. Which category of On-chip Peripherals is most relevant for Body and Chassis control applications in automotive systems? 1 1 5

(A) Communication Peripherals
(B) Sensor Interfaces
(C) Motor Control Peripherals
(D) Display Interfaces

18. Renesas is a prominent manufacturer of processors for which industry? 1 1 5

(A) Aerospace
(B) Automotive
(C) Healthcare
(D) Smartphones

19. Ethernet is becoming increasingly popular in automotive networks due to its: 1 1 5

(A) Low bandwidth
(B) High data transfer rates and reliability
(C) Limited compatibility
(D) Short cable lengths

20. In an RTOS case study involving real-time hardware, what would be a critical consideration for ensuring the system's reliability? 1 1 5

(A) Maximum clock frequency
(B) Average power consumption
(C) Predictable response times
(D) Aesthetic design

PART - B (5 × 4 = 20 Marks) Marks BL CO

Answer **any 5** Questions

21. What are the challenges in embedded system design? 4 1 1

22. Compare CISC and RISC instruction set architectures 4 1 1

23.	Draw the picture of memory in microcontroller and list the memory signals	4	1	2
24.	How does Flash Memory differ from other types of memory devices in embedded systems?	4	1	2
25.	What are the factors to consider when analyzing and optimizing energy and power consumption in embedded systems?	4	1	3
26.	What is the difference between cooperative and pre-emptive multi-tasking?	4	1	4
27.	How do architectural attributes of automotive grade processors differ from general-purpose processors?	4	1	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO
28.	(a) What are the critical characteristics of embedded systems?	12	1	1
	(OR)			
	(b) Describe and illustrate the Motorola 68HC11's architecture.			
29.	(a) With necessary diagrams, discuss in detail ROM, UVROM, EEPROM, Flash Memory, DRAM	12	1	2
	(OR)			
	(b) Design a 8051-based system with 8K bytes of ROM and 8K bytes of RAM.			
30.	(a) Explain the Embedded system Programming, Compiling, Assembling, Linking and Debugging	12	1	3
	(OR)			
	(b) What is Task scheduling? Explain any two Task scheduling algorithms with suitable examples.			
31.	(a) Explain the Kernel Features in Real-time Kernels and Polled Loops System	12	1	4
	(OR)			
	(b) What are the types of multi-tasking? Explain any two types of multitasking with a suitable example.			
32.	(a) What are automotive-grade processors? Explain the characteristics of automotive-grade processors.	12	1	5
	(OR)			
	(b) Explain the CAN Serial Bus Communication for networking used for automotive communication protocols.			

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