Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50504

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Seventh/Eighth Semester

Electronics and Communication Engineering

EC 8791 — EMBEDDED AND REAL TIME SYSTEMS

(Common to Biomedical Engineering/Medical Electronics)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How does the design of embedded system differ from general purpose computing system?

2. List the typical hardware components of an embedded platform.

3. Compare the features of RISC and CISC architecture.

4. Given the contents of R3 and R4 as R3 = OXOFFOOFFO, R4 = OXFFOOFFO and R_0 = o. Obtain the value of R1 and R5 after excenting the following instructions :

   EORS R1, R3, R4

   ANDS R5, R3, R0.

5. Which are the typical software components of embedded system?

6. Differentiate the role of absolute and relative addressing in embedded programming.

7. What are the essential factors to be considered in estimating program run times?

8. Mention the method of dealing with sporadic tasks.

9. Define multirate systems and give two real time examples.

10. Why are the scheduling status considered in a process?

PART B — (5 × 13 = 65 marks)

11. (a) (i) What are the challenges accounted in embedded system design? (6)

(ii) Explain the selection of hardware architecture while choosing the computing platforms. (7)

Or

(b) (i) Elaborate the major levels of abstraction in embedded system design process with a flow chart. (6)

(ii) Discuss the techniques and tools involved in the debugging process of embedded system. (7)

12. (a) (i) Explain the architecture of AMBA Bus alongwith VPB divider structure. (6)

(ii) Name the important SFRS of Timer ϕ in ARM-LPC 214X family controller with timer operation. (7)

Or

(b) (i) Elaborate the operation of vectored interrupt controller as a peripheral. In your discussion, highlight the VIC table and the SFRS. (9)

(ii) Illustrate the calculation of duty cycle using the PWM unit of ARM controllers. (4)

13. (a) (i) Illustrate the flow of program generation from compilation through loading. Specify the roles of assemblers and linkers in the compilation process. (7)

(ii) Discuss the performance analysis of embedded system at program level by measuring the execution speed. (6)

Or

(b) (i) Demonstrate the compilation of the arithmetic expression : $X = a * b + 5 * (c - d)$ with the help of control flow graph. (7)

(ii) How does the loop optimization technique differ from cache optimization process in measuring the software performance? Explain the concept through code motion in a loop. (6)

14. (a) Discuss the scheduling strategy of pre-emption earliest deadline first algorithm for the set of aperiodic tasks arrival to a system as given below:

Task	Arrival time	Execution time	Absolute deadline
T_1	0	10	30
T_2	4	3	10
T_3	5	10	25

Or

(b) How does a non-fault tolerant synchronization algorithm operate with a simple procedure for synchronization? Consider a three clock system and demonstrate the Amortised clock adjustment and slave-master interaction. (13)

15. (a) What are the two basic concepts considered in pre-emptive RTOS systems? Explain the rate monotonic scheduling with the timing diagrams.

Or

(b) Name the major styles of inter process communication referred in RT system. Discuss the operation of Mail boxes and Message passing in detail.

PART C — (1 × 15 = 15 marks)

16. (a) Design a handheld device that displays the user a map of the terrain about the user's current position. The map display should change as the user and the map device change position. The moving map obtains its position from the GPS navigation system. Give out the

(i) Requirement analysis (3)

(ii) System specification (3)

(iii) Architecture design (3)

(iv) Hardware and software components (3)

(v) System integration. (3)

Or

(b) Analyze the design of a motion estimation video accelerator with the following details

(i) Architecture (5)

(ii) Algorithms and requirements (5)

(iii) Component design and system testing. (5)

———————