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

Question Paper Code : 80579

B.E. / B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Sixth / Seventh / Eighth Semester

EE 8691 — EMBEDDED SYSTEMS

(Common to : Electrical and Electronics Engineering / 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. Distinguish between a microprocessor and a microcontroller.

2. List any four factors to be considered for selection of a processor for an application.

3. How does RS 422 perform differential signaling?

4. What is the need for device drivers?

5. Distinguish between data flow graph and control data flow graph.

6. Draw the use case diagram of a seat belt warning system.

7. What is the role of an interrupt handler in an RTOS?

8. Discuss the benefits of microkernel model.

9. What is the role of MOST bus in automotive communication network?

10. Mention any four key players in Automotive embedded market.

PART B — (5 × 13 = 65 marks)

11. (a) (i) State the difference between little-endian and big-endian notation with example. (7)

(ii) How is real time clock implemented in an Embedded system? (6)

Or

(b) (i) Distinguish between the operations of a timer and counter. (7)

(ii) What is the role played by a watchdog timer in an Embedded system? (6)

12. (a) (i) Explain the major control signals in CAN protocol. (7)

(ii) Describe various signaling in RS-485 Interface. (6)

Or

(b) (i) Distinguish between I2C and SPI communication Interface. (7)

(ii) Explain the RS 232 serial Interface in detail. (6)

13. (a) (i) Draw the relationship between various phases of Embedded product development life cycle model. (7)

(ii) Explain the important hardware software trade-offs during hardware-software partitioning. (6)

Or

(b) (i) Draw the flowchart of sequential program model for a seat belt warning system. (7)

(ii) Draw the data flow graph of the following set of equations. (6)

$X1 = a * b$

$y = a + c$

$z = x1 - d$

$x2 = y * d$

$x3 = x2 / c$

14. (a) (i) Three processes with process ID P1, P2, and P3 with estimated completion time of 5, 10 and 7 milliseconds respectively enters the ready queue in the order P1, P2 and P3. Process P4 with estimated execution completion time 2 milliseconds enters the ready queue after 5 milliseconds. Calculate the waiting time and turnaround time for each process. Also, calculate the average waiting time with FIFO scheduling. (7)

(ii) Compare threads and processes in detail. (6)

Or

(b) (i) Three processes with process ID P1, P2, and P3 with estimated completion time of 4, 6 and 5 milliseconds respectively and priorities 1, 0 and 3 (0 – highest, 3 – lowest) enter the ready queue together. Calculate the waiting time and turnaround time for each process. Also, calculate the average waiting time with non-preemptive priority based scheduling. (7)

(ii) Describe the activities performed during context switching. (6)

15. (a) Describe the detailed design of a washing machine. (13)

Or

(b) Elaborate on the steps involved in the design of a ATM machine. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Design a coin operated public telephone unit based on FSM model for the requirements as mentioned below :

(i) Calling process is initiated by lifting the receiver of the telephone unit.

(ii) 1 rupee coin to be inserted to make a call, if the line is busy the coin to be returned to the user.

(iii) If the line is through, allow the user to talk till 60 seconds, with a beep at 45 seconds to insert the second coin.

(iv) Terminate the call if the second coin is not inserted.

(v) System ready to accept a new user.

Or

(b) Consider a traffic light controller with three lights red, green and yellow. Timers 1, 2 and 3 decide the ON time of the lights. Once the green light is ON, it remains ON for a time decided by Timer 2. When Timer 2 expires, the green light goes OFF and the yellow light becomes ON, and the current state is YELLOW. Similarly red and yellow lights are controlled by corresponding timers. Design the system and obtain the FSM model.

———————