Paper / Subject Code: 37814 / Embedded Systems and Real Time Operating Systems
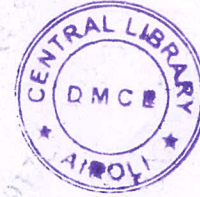
TE (ELEX) Sem VI R'19 'C' scheme 22-05-2025

Time: 3 hrs

Marks: 80

Note:-

1. Question 1 is compulsory
2. Solve any 3 questions out of the remaining 5.
3. Assume suitable data wherever necessary

Q. 1 Solve any 4 out of 5   (20 marks)

   a. Describe the key components of an embedded system. Compare   (5)
      RISC and CISC processors.

   b. State and explain the modes of operation of ARM Cortex processor.   (5)

   c. Describe the working of I2C bus.   (5)

   d. What are issues like deadlock, live lock and race condition in RTOS? (5)

   e. What are various software testing methods for embedded products?   (5)

Q. 2 a. Explain the following design metrics i) Power dissipation ii) Cost
    iii) Time to market iv) NRE Cost and v) Performance.

   b. Describe the low power consumption feature of ARM Cortex processor   (10)

Q.3 a. Describe with diagram application of CAN bus for communication   (10)
    in automobiles.

   b. Explain resource management and interrupt management feature in   (10)
    FreeRTOS.

Q.4 a. What is priority inversion problem in RTOS. Explain with illustration.   (10)
   b. Consider the set of 5 processes whose period and priority are given   (10)
    below,

Process Id/Task	Period (Ti)	Execution time (Ci)
P1	50	10
P2	100	20
P3	200	50

Determine theoretically whether the above tasks are schedulable or NOT under RMA. Also show graphically. (Use Liu and Layland Technique of Utilization Bound Theorem).

Q.5 a What are binary and counting semaphores? Explain with an example in RTOS   (10)
   b. Design an embedded system for a tea/coffee wending machine, highlighting   (10)
    its a) Specification requirements (choice of components), b) hardware
    requirement (Block Diagram) and c) Software architecture.

Q.6 Write short notes on any 4   (20)
   a. NVIC of ARM cortex.
   b. Task states of RTOS
   c. IPC in RTOS.
   d. RS 232 bus
   e. Waterfall Model for embedded product development life cycle.

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QP code

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Prog. code

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