Exam Date & Time: 08-May-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SIXTH SEMESTER B.TECH. DEGREE EXAMINATION - April / May -2024

EMBEDDED SYSTEM DESIGN [ECE 4053]

Marks: 50 **Duration: 180 mins.**

PART-A

Answer all the questions.

1) List and narrate the three main processor technologies. What are the benefits of using each of the three different processor technologies? (4)

A)

B) Using the simplified revenue model, compute the percentage revenue loss if D = 5 and W = 10. If the company whose product entered the market on time earned a total revenue of $25 million, how much revenue did the company that entered the market 5 months late lose? (3)

C) Compare the critical section and atomic section. How does the microprocessor know where to find the interrupt routine when the interrupt occurs? Explain in detail. (3)

2) Describe the following message passing methods of inter process communication:

i. Message Queue ii. Mailbox (4)

A)

B) Describe the function queue scheduling software architecture for an embedded system. (3)

C) What are the differences between thread and process in an operating system. (3)

3) Three processes with process IDs P1, P2, P3 with estimated completion time 10, 5, 7 milliseconds respectively enters the ready queue together. A new process P4 with estimated completion time 2ms enters the 'Ready' queue after 2ms. Assume all the processes contain only CPU operations and no I/O operations are involved. Calculate the followings in Preemptive Shortest Remaining Time First scheduling algorithm.

A)

i. Waiting time for each process

ii. Turn Around Time (TAT) for each process.

iii. Average waiting time

iv. Average Turn Around Time (4)

B) What is the deadlock condition? Describe the factors favoring the deadlock condition. (3)

C) Design and describe an automatic tea/coffee vending machine based on FSM model for the following requirement:

The tea/coffee vending is initiated by user inserting a 5 rupee coin. After inserting the coin, the user can either select ‘Coffee’ or ‘Tea’ or press ‘Cancel’ to cancel the order and take back the coin. (3)

4) Discuss the functions of all the fields in the standard CAN frame with neat format. (4)

A)

B) Illustrate the operational steps involved in I2C bus for communication with the slave nodes. (3)

C) Write an embedded C program to generate a square of 2KHz frequency on pin P1.5 of 8051 microcontroller. Assuming crystal frequency 11.0592 MHz’s. (3)

5) Describe an algorithmic step to add a node at the end of single linked list. Write a function code in C to insert a new node at the end of the single linked list. Assume that a node in the linked list has two fields, one for data and another to hold address. The HEAD is the global

A) pointer variable which holds the address of the first node. The function prototype is given below: (4)

void insertNodeAtEnd(int data)

B) State and explain the three primary objectives of the Embedded Product Development Life Cycle (EDLC) in detail. (3)

C) Discuss the waterfall model in EDLC with relevant block diagram. (3)

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