Indian Institute of Information Technology, Sri City, Chittoor

Name of the Exam: Embedded Systems (ES) Duration: 90 mins Max. Marks: 30 Marks

Instructions:

1. Closed book exam
2. Must turn on video and mic throughout the exam.
3. Please keep enough A4 sheets to write answers. Each A4 should have your Name, Roll number and page number on the top right corner.
4. Charge your laptops and mobiles ahead of exam to avoid issues during the exam. Suggested to keep alternate mobile phones in case of network issues
5. Total Exam session will be recorded.
6. Each student should start scanning the answer scripts in the order from 12:30 PM and should submit before 12:40 PM as a single pdf document through the shared google classroom link. File name: **Roll_No_Name_Set1_ES_21.pdf**
7. Assumptions made should be clearly stated
8. All sub-parts of the question should be written together

I. a) Explain SAR ADC with block diagram? Derive the bit pattern Step by step following the algorithm for
i) 4 bit and ii) 6 bits. for Vref = 5 volts, Vin = 2.73 volts?
iii)Calculate the errors for both 4 bit and 6 bit? [2 +2+2M]

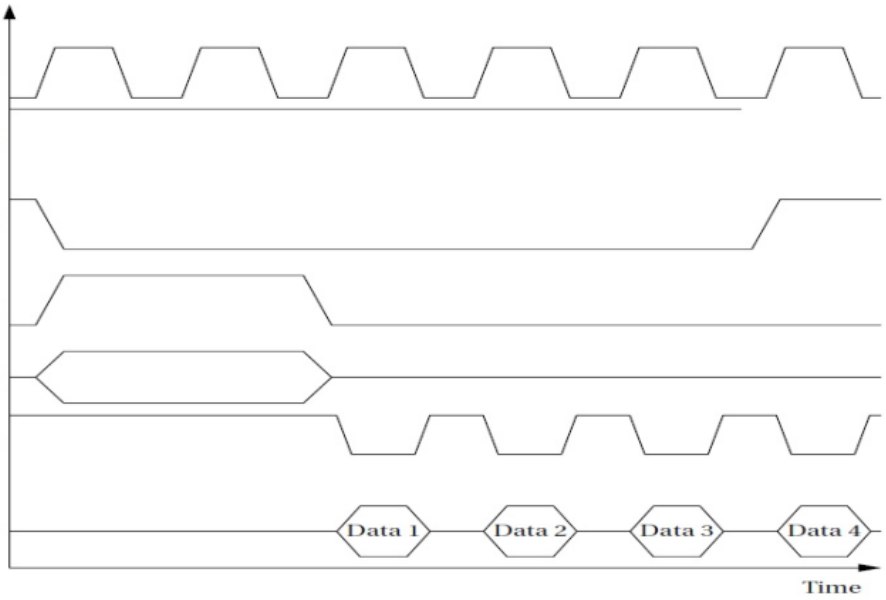
b) Explain the Top down approach (5 phases) of a smart watch with display of step count, oxygen level and temperature and connect to a smart phone [4M]
Note: State the assumptions clearly

II.

a) Write Embedded C code to interface a Temperature sensor to a 10 bit ADC of microcontroller board and convert it into proper units of measurement? [4M]
b) Write Embedded C code to realize an obstacle avoidance bot with ultrasonic sensor and four motors. Bot should gradually reduce the speed in 75-50-25-0% speed without colliding obstacle and reverse its direction from obstacle in a gradual manner of 0-25-50-75-100%. Assume a threshold distance of 20 CM to initiate the above algorithm. [6M]

III.

a. Consider two processors P1 and P2 executing the same instruction set. Assume that under identical conditions, for the same input, a program running on P2 takes 20% less time but incurs 25% more CPI (clock cycles per instruction) as compared to the program running on P1. If the clock frequency of P1 is 1GHz, then the clock frequency of P2 (in GHz) [4M]
b. Explain briefly the addressing and the arbitration of I2C protocol? [2M]
c. Explain briefly the below bus timing timing diagram ? [4M]



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