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MANIPAL INSTITUTE OF TECHNOLOGY Manipal University SIXTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION - APRIL / MAY 2017 SUBJECT: EMBEDDED SYSTEM DESIGN (ECE - 308)

TIME: 3 HOURS

Instructions to candidates

MAX. MARKS: 50

- Answer **ANY FIVE** full questions.
 - Missing data may be suitably assumed.
- 1A Describe the operational quality attributes in Embedded System design in detail.
- 1B Why do we require the following, in embedded system? Give reasons. i) Memory controller ii)Interrupt controller iii) Initialization code
- 1C The NRE cost and time to prototype involved in designing an ES is \$500 and 1 month respectively. The unit cost involved in designing a single unit is \$100 and the design turn-around time is 2months. Total 100 units are produced. Calculate the total cost and the time to market.

(5+3+2)

- 2A Three processes with process IDs P1, P2 and P3 with estimated completion time 8, 6, 10 milliseconds enters the ready queue together. Process P4 with estimated completion time 4ms enters the ready queue after 2ms. Calculate the waiting time, TAT, average waiting time and average TAT if the following scheduling algorithms are used in scheduling the processes.
 - (a)Non-pre-emptive SJF scheduling
 - (b) Pre-emptive SRT scheduling
 - (c)Which scheduling algorithm gives a better performance?
- 2B Briefly explain the following communication protocols i) I2C ii) Wi-Fi iii) SPI.
- 2C Write the significance of bit banding in ARM cortex processor.

(5+3+2)

- 3A What is multitasking? Explain the types of multitasking. Write the need for context switching and context retrieval in multitasking.
- 3B Explain 'process' and 'thread' with diagrams. Highlight the difference between process and thread.
- 3C 8051 is interfaced with a PPI chip. The control word of PPI is 91h. Write its significance.

(5+3+2)

- 4A Write two differences between the following:
 - i). Monolithic Kernel and Micro kernel ii
 - iii). Process and thread

- ii). GPOS and RTOS
- iv). Semaphore and mutex
- v). Hard real time and Soft real time
- 4B Explain the ARM data path activity of the instruction LDR R1, [R2, 0x24]!
- 4C List any four features of ARM cortexM3 processor which delivers high performance in microcontroller products.

(5+3+2)

- 5A Draw the typical AMBA bus architecture and explain. Write the functional blocks used in the ARM cortex M3 processor with relevant advanced microcontroller bus types.
- 5B The 'EOC' signal of an ADC is connected to the $\overline{INT0}$ pin of 8051 and also the converted data from ADC is available in Port1 of 8051. Write an embedded C code for 8051 to read the Port1 when ADC interrupts the controller after conversion and send the data available in Port1 to Port2 continuously
- 5C Explain the following signals used in AMBA i) BTRAN ii)BPROT iii)BSIZE iv) BWAIT

(5+3+2)

- 6A. Write the computational models used in the embedded system design. Write the FSM model and sequential machine model for an automatic washing machine. The system requirements are: i) When the power is on the system will wait for 5 seconds to close the door and opens the water inlet. Ii) Then it will check for sufficient water level and closes the water inlet. iii) When the water stops the motor for wash section starts and run for 15 minutes. In any case the system will be in idle mode if there is no power and door is open.
- 6B. What is EDLC? Write its significance.
- 6C. Draw the RC based reset circuit and explain the working.

(5+3+2)