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M.Tech. Degree Examination, June/July 2011
Advanced Microcontrollers

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. Describe the major features in embedded systems that lead to a low-power architecture. (06 Marks)
- b. Briefly elaborate the applications requiring low-power architecture. (04 Marks)
- c. Explain with a neat block diagram, the architecture of MSP430 microcontroller. (10 Marks)
- 2 a. For the following instructions, explain the addressing modes used and the contents of the destination operand after the instructions execution (Given R4 = 104, R5 = 134. Assume suitable data in the concerned memory locations.)
 - i) ADD.W R4, R5
 - ii) MOV #104, R8
 - iii) ADD 3(R4), R5
 - iv) AND @(R4), R5
 (06 Marks)
- b. With examples explain the working of the following instructions :
 - i) RRA
 - ii) RRC
 - iii) RLA
 - iv) RLC
 (04 Marks)
- c. Write a MSP430 assembly language program to exchange two numbers (of byte width) stored at locations 800H and 850H. (06 Marks)
- d. Write a note on the three internal clocks in MSP430. (04 Marks)
- 3 a. Explain the following special function registers – P2OUT, P2REN, P2IES and P2DIR. (04 Marks)
- b. What are the features and functions of the watch-dog timer? (05 Marks)
- c. Illustrate the capture and compare modes of operations in Timer-A of MSP430. (06 Marks)
- d. Describe the RTC (Real Time Clock) module of MSP430. (05 Marks)
- 4 a. Using the comparator-A module of MSP430, realize a single slope AID conversion. (07 Marks)
- b. With a neat block diagram, highlighting the important I/O pins, registers and internal signals used, explain the operation of the ADC10 module of the MSP430 microcontroller. (08 Marks)
- c. Explain the important low power modes of operation of MSP430. (05 Marks)
- 5 a. Describe the architecture of cortex-M3 processor with a block diagram. (10 Marks)
- b. Explain the memory map of cortex-M3 processor. (04 Marks)
- c. Write a note on the usage of link register and program status registers. (06 Marks)
- 6 a. How are the stacking, vector fetch and register updates executed when an exception occurs? (07 Marks)
- b. Explain nested interrupts, tail-chaining interrupts and the late arrival exception handling. (06 Marks)
- c. List and explain the functions of the NVIC's registers used in interrupt handling. (07 Marks)
- 7 a. What happens during lockup in cortex M3 processor? (06 Marks)
- b. What are the advantages of using MPU? With a flow chart explain the steps used to set-up the MPU. (08 Marks)
- c. Explain the two Debug modes in cortex-M3. (06 Marks)
- 8 a. Develop an application to send and receive a character (or a text message) between a base station and a remote station. Use USCIx communication module of MSP430 and the CC2500 radio transceiver at each end. (10 Marks)
- b. Explain how PWM can be used to vary the power supplied to a load? Also, explain the PWM generation in MSP430. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

