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### **GUJARAT TECHNOLOGICAL UNIVERSITY** ME - SEMESTER- II EXAMINATION – SUMMER 2014

## ME - SEMESTER- II EXAMINATION - S

# Subject Code: 725401

# Subject Name: Mixed Signal Controllers

### Time: Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.

## Q.1 (a) Answer the following questions in relation with MSP430 CPU.

- 1) What is the role of GIE bit in status register?
- 2) How can you give an interrupt signal to MSP430, which will be considered as Non Maskable one?
- 3) How JTAG interface is supported in MSP430?
- 4) Give an example of emulated instruction.
- 5) How Low Power Mode LPM4 is different in comparison with other low power modes?
- 6) Comparator can be considered as 1 bit ADC. ó Justify this statement.
- 7) What is the difference between Straight Binary and 2¢s Complement mode in DAC?
- (b) Answer the following questions.
  - 1) Justify the orthogonal nature of MSP430 CPU with required examples of instructions.
  - 2) Explain the role of DCO in generating required clock frequencies.
- Q.2 (a) It is required to generate a square wave with ON time as 800 msec and 07 OFF time also as 800 msec. Discuss the configuration for Watch dog timer to implement this task.
  - (b) Explain the capture mode of operation in Timer with the help of a block 07 diagram.

### OR

(b) Describe all the modes supported by Watch Dog Timer to help in system 07 design.

## **Q.3** (a) Answer the following questions.

- 1) Explain the stack operations supported with MSP430 CPU.
- 2) Explain the use of Analog to Digital Convertor in digitizing multiple analog channels.
- (b) It is required to acquire an analog signal at a sampling frequency of 07 2KHz. Discuss the requirements of Timer and its configuration along with configuration for ADC module with required Special Function Registers in MSP430 for this task.

## OR

- Q.3 (a) Answer the following questions.
  - 1) Explain the methods to achieve low power consumption in Microcontroller based system design.
  - 2) Explain the role of Buffer in ADC.

# Total Marks: 70

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- (b) Configure Digital to Analog Convertor module and Timer module to 07 generate a saw tooth waveform of 100 Hz frequency. Write C Program for the same.
- Q.4 (a) Use Hardware multiplier to implement following equation where a(i) and 07 b(i) are two arrays each of 16 bit size. Write C language Program for this task.

$$Y = \int_{i=0}^{9} (a \ i \ *b(i))^2$$

(b) Discuss the method of implementing Single Slope measurement with 07 Comparator in MSP430 CPU.

#### OR

- Q.4 (a) Explain the set of registers in Hardware Multiplier module along with 07 mathematical operations supported.
- Q.4 (b) Explain the operation associated with Grouping of multiple DAC modules 07 in MSP430 with necessary waveform and block diagram.
- Q.5 (a) Explain all the addressing modes in association with DMA Controller. 07
  - (b) Answer the following questions.
    - 1) Explain Single Transfer and Block Transfer modes with DMA Controller?
    - 2) Explain any three triggering sources for DMA Controller operation.

### OR

- Q.5 (a) Describe the characteristics of Burst-Block Transfer mode in DMA 07 controller. Explain an application in which this mode can be useful.
  - (b) Explain a case study to use ADC, Hardware multiplier and DMA 07 controller in the implementation of convolution algorithm.

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