



# P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

**Fourth Semester, B.E. - Electronics and Communication Engineering**

**Semester End Examination; May/June - 2019**

## Microcontroller

*Time: 3 hrs*

*Max. Marks: 100*

*Note: Answer FIVE full questions, selecting ONE full question from each unit.*

### UNIT - I

- |      |   |   |
|------|---|---|
| 1 a. | What is Embedded system? Describe the different approaches to Embedded system.                      | 6 |
| b.   | Explain different types of memory used in microcontroller.  | 8 |
| c.   | Describe types of software languages used for programming a microcontroller. Give example for each. | 6 |
| 2 a. | Write the block diagram of MSP430F2013 and explain each block.                                      | 9 |
| b.   | Discuss how the memory is mapped in F2013 controller?   | 7 |
| c.   | Differentiate between Von-Neumann and Harvard architecture.   | 4 |

### UNIT - II

- |      |   |    |
|------|---|----|
| 3 a. | With example, explain the operations of stack and stack pointer in MSP430 microcontroller.  | 6  |
| b.   | What is addressing mode? List the different addressing modes used in MSP430 and explain each with an example.   | 10 |
| c.   | Write the syntax and function of the following instruction :  | 4  |
|      | i) <code>dadc.w</code> ii) <code>bis.w</code> iii) <code>jn</code>  |    |
| 4 a. | Write the machine code for the following instructions :   | 6  |
|      | i) <code>add.w, R5, R6</code> ii) <code>mov.w @R5+, 0x1020 (R12)</code> iii) <code>mov.b #4, R6</code>  |    |
| b.   | Using pointer, write a C function to copy a string. Also write the subroutine using MSP430 instructions to copy source string starting in R14 to destination starting in R12. | 6  |
| c.   | Write the simplified block diagram of the clock module of MSP430F2XX family. Explain each block.  | 8  |

### UNIT - III

- |      |   |    |
|------|---|----|
| 5 a. | What is subroutine? Describe what happens when a subroutine is cal-by?  | 5  |
| b.   | Explain the different ways for storing the local variables in subroutine.   | 5  |
| c.   | Write a subroutine in MSP430 assembly language to give delay of 'n' times the 0.1 s delay. Consider outer big loop and inner little loop with loop count value of 130 and 100 respectively to give 0.1 s delay. Take; $n = 5$ and it must be pass as a parameter from calling routine. Use stack to store parameter and loop count value. | 10 |
| 6 a. | What is an interrupt? Describe the steps happens when an interrupt is requested.  | 8  |

- b. Using MSP430, write an assembly language program to toggle LED's with period of 0.5 s using interrupt generated by Timer-A in UP mode. 8
- c. Explain the various low-power modes of operation. 4

**UNIT - IV**

- 7 a. What is watchdog timer? Give example. Explain watchdog timer control register WDTCTL. 10
- b. With block diagram and control register, explain basic Timer 1. 10
- 8 a. Sketch the output from channels 0 and 1 of timer-A in UP mode and analyze the edge aligned PWM in the UP mode configuration of timer-A. 10
- b. Draw the simplified block diagram of timer-A showing the timer block and capture compare channel 1. Explain with control register. 10

**UNIT - V**

- 9 a. Analyze the operation of comparator A<sup>+</sup> with circuit diagram and equations. 10
- b. Explain the practical issues with respect to ADC. 10
- 10 a. Write the circuit diagram of 4-bit charge redistribution successive approximation ADC. Explain its operation. 10
- b. With block diagram, explain the architecture of ADC10. 10

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