



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

(An Autonomous Institution affiliated to VTU, Belagavi)

**Sixth Semester, B.E. - Electrical and Electronics Engineering**

**Semester End Examination; June - 2017**

**Microcontrollers and PLC**

*Time: 3 hrs*

*Max. Marks: 100*

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

### UNIT - I

1. a. Draw the block diagram of 8051 micro controllers and explain only the various registers available. 8
- b. Explain the various criteria used for selection of 8051 micro controller. 5
- c. Identify the addressing modes of the following instructions:
 

i) MOV A, @ Ri	ii) MOV A, #52H	iii) MOV A, 50H
iv) MOV A, R <sub>n</sub>	v) MOVC A, @ A + DPTR	vi) MOVX A, @ PC + A
vii) MOV DPTR, # 1234H.		

7
- 2 a. Distinguish between Harvard and Voneuman architectures. 5
- b. Explain the memory and organization of 8051 microcontroller. 5
- c. What is the need of addressing modes? Explain with an example the various addressing modes of 8051  $\mu$ c. 10

### UNIT - II

- 3 a. Explain the PUSH and POP operation with an example. 6
- b. What is the advantage of bit level instructions? What is the range of bit level RAM in 8051  $\mu$ c? Explain bit level logical instructions. 6
- c. Write an ALP to find the largest of N, 8-bit numbers with the inputs and outputs obtained from the program. Assume the data stored in external RAM. 8
- 4 a. With an example, explain the various rotate and swap operations. 6
- b. Explain the following instructions with an example:
 

i) ADDC A, R <sub>n</sub>	ii) ADD A, @ R <sub>i</sub>	iii) ADDC A, # data
iv) SUBB A, # data	v) SUBB A, @ R <sub>i</sub>	vi) MUL AB.

6
- c. Write an ALP to add ten, 8-bit numbers stored in an array. Store the result obtained as 16-bit. 8

### UNIT - III

- 5 a. Explain the various types of jump instructions with their relative jump. 6
- b. Explain the following instructions with an example:
 

i) ACALL	ii) LCALL	iii) RET	iv) RETI
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4
- c. What is the need of interrupt? Explain the structure of interrupts in 8051  $\mu$ c. 10

6. a. Explain the various types of CALL instructions based on their range. 4
- b. Explain the following instructions with an example:
- |                          |                                      |               |   |
|--------------------------|--------------------------------------|---------------|---|
| i) JMP @ A+DPTR          | ii) JC rel                           | iii) JNB rel  |   |
| iv) JBC bit, rel         | v) CJNE <dest-byte>, <src-byte>, rel |               | 8 |
| vi) DJNZ byte, <rel-add> | vii) JMP @ A +PC                     | viii) JZ rel. |   |
- c. Write an assembly language program to glow LED for a fraction of second when external interrupt INTO is activated. 8

#### UNIT-IV

- 7 a. What is the advantage of serial communication over parallel communication? Explain with an example simplex, half duplex and full duplex mode of communications. 7
- b. Explain the structure of SCON register and its use in serial communication. 5
- c. Write an ALP to generate a waveform with a duty cycle of 30% (3 ms ON and 10 ms OFF) on all pins of port '0'. Take crystal oscillator frequency XTAL = 22 MHz. 8
- 8 a. Distinguish between synchronous and Asynchronous serial communication. 6
- b. What is the difference between a timer and counter? Explain various modes of operation of counters/ timers 8
- c. Write a program to generate a square wave of 100 kHz on pin 2.3, using timer '0' in mode '1'. Assume the clock frequency is 22 MHz. 6

#### UNIT-V

- 9 a. What is PLC? Draw the block diagram and explain the various parts of it. 10
- b. Implement the ladder and functional block diagram for the following logic: 10
- |        |         |
|--------|---------|
| i) AND | ii) OR. |
|--------|---------|
- 10 a. Classify the various types of counters with ladder diagram. 10
- b. Explain the working of ON-delay, OFF-delay and pulse timer with relevant ladder diagrams. 10

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