Shanghai University, Year 2012～2013, Spring Semester, Final Exam Paper A

Course Name：Microprocessors and Embedded Microcontrollers

Course Code：23325032 Credit：6

Score

应试人声明：

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Student Name_____ Student number_____

PROBLEM	1	2	3	4	5	6	7	8	9
Score									

Notes to candidates:

1) Write your answer on the examination paper using pen or ball point pen and return it at the end of the examination.

2) The following SFRs might be used in this exam.

SFR	D7	D6	D5	D4	D3	D2	D1	D0
IE	EA	-	ET2	ES	ET1	EX1	ET0	EX0
IP	-	-	PT2	PS	PT1	PX1	PT0	PX0
SCON	SM0	SM1	SM2	REN	TB8	RB8	TI	RI
TCON	TF1	TR1	TF0	TR0	IE1	IT1	IE0	IT0
TMOD	GATE	C/T	M1	M0	GATE	C/T	M1	M0

Problem 1 (20 points):

*Problem 1 contains **TEN** questions. Candidates should answer **ALL** the questions. (2 marks for each question)*

1. If a microcontroller is with a 24-bit address bus, then the data space which can be addressed by the computer is_____ bytes, namely, _____megabytes?

2. Which of the following are **TRUE** statements about the 8051 microcontroller?_____

1) 0 and 5 V digital pulses can be transferred on the telephone without being converted (modulated).
2) Dynamic RAM It must be refreshed periodically. While it is being refreshed, the data cannot be accessed.
3) The data bus and control buses are bidirectional.
4) All the ports upon RESET are configured as output ports.
5) The longer the cable, the higher the data transfer baud rate.

3. In the 8051 addressing mode, the offset of the relative address is from _____ to _____.

4. Which of the following instructions are legal ?_____

1) MOV 25H, #25H
2) ADD R7, R4
3) MOV R9, #50H
4) MOVX A, 80H
5) ADDC A, #500
6) MOV @R3, #03H

5. Suppose SP=0AH originally and internal RAM locations 09H and 0AH contain the values 30H and 01H respectively. After the instruction RETI is executed, the SP will be and PC will be _____.

6. Every 8051 family member wakes up at address _____ when it is powered up.

7. In 8051 assembly programming, after adding packed BCD numbers, the result is no longer BCD, therefore, the instruction _____ must be used after the addition of BCD

operands.

8. If an 8051 is rate as 25MHz, which of the following frequency can be connected to the microcontroller ? _____

1) 15MHz 2) 25MHz
3) 35MHz 4) 50MHz

9. The hexadecimal number of the decimal number **2022** is _____. The 2's complement of the hexadecimal number **4A** is _____.

10. The decimal number -23 is represented by the assembler as _____. The decimal number -128 is represented by the assembler as _____.

1) 10001100 2) 11101001 3) 11100100
4) 100010111 5) 10000000 6) 01111111

Problem 2 (24 points):

*Problem 2 contains six questions. Candidates should answer **ALL** questions.* **(4 marks for each question)**

1) Assume accumulator A contains 56H. What are the results in accumulator A after the following instructions are executed, respectively? (1 point each)

1) XRL A, 0FF **2) ANL A, 0FH**
3) ORL A, 0FH **4) CPL A**

Solution:

2) Assuming XTAL = 12MHz, indicate when the TF0 flag is raised for the following program.

```
MOV   TMOD, #01
MOV   TL0, #1BH
MOV   TH0, #FFH
SETB  TR0
```

Solution:

3) Find the time delay for the delay subroutine shown below, if the system frequency is 12 MHZ.

```
DELAY:  MOV   R2, #100
AGAIN:  MOV   R3, #150
HERE:   NOP
        NOP
        DJNZ  R3, HERE
        DJNZ  R2, AGAIN
        RET
```

Solution:

4) For the instruction

LCALL LOC_SUB

If SP=0AH initially and the label "LOC_SUB" is at program memory location 0300H, after executing the instruction at location 0102H, what values are in the SP, PC, and

internal RAM locations 0BH and 0CH.
Solution: SP = , PC = ,
(0BH) = , (0CH) = (1 point each)

5) Write down the priority of the six interrupts in 8051 after the instruction **MOV IP , #00001010B** is executed.
Solution:

6). Find the CY and AC flags for each of the following.

(a) **MOV A, #0EFH**
SETB C
ADDC A, #0

(b) **CLR C**
MOV A, #0FEH
ADDC A, #17
ADDC A, #0

Solution: (1 point each)
(a) CY:
AC:

(b) CY:
AC:

Problem 3 (6 points)
Find the result at points (1), (2), and (3) in the following code?

```
        CJNE A, #AAH, COMP
                …                ;point (1)
        COMP:   JNC NEXT
                …                ;point (2)
        NEXT:    …               ;point (3)
```

Solution: (2 point each)
Point(1)

Point(2)

Point(3)

Problem 4 (15 points)
The following program is used to add the BCD augend 55 and 66 in RAM locations 40H and 41H with the addend 66 and 88 in RAM locations 50H and 51H, and then store the sum of the addition into RAM locations 50H、51H and 52H. Fill in the following blanks. (1 point for each blank in the code, 0.5 point for each blank in the results)

Source code		Address	The results	
	ORG 0000H		The first cycle	The second cycle
START:	MOV R0,#40H	0000H	(R0)=	
	MOV R1,#50H	0002H	(R1)=	
	MOV R2,#2	0004H	(R2)=	
	_____ C	0006H	(CY)=	
LOOP:	MOV A,@R0	0007H	(ACC)=	(ACC)=
	_____ A,@R1	0008H	(ACC)=	(ACC)=
	_____ A	0009H	(ACC)=	(ACC)=
	MOV @R1,A	000AH	((R1))=	((R1))=
	INC R0	000BH	(R0)=	(R0)=
	INC R1	000CH	(R1)=	(R1)=
	DJNZ R2,_____	000DH	(R2)=	(R2)=
	CLR A	000FH	(ACC)=	
	ADDC A,#0	0010H	(ACC)=	(CY)=
	MOV @R1,A	0012H	((R1))=	
	NOP			
	END			

Problem 5 (6 points)

Assuming XTAL = 12 MHz, write a 8051 program to generate a square wave on pin P1.3 using timer 0 in mode 2.

```
        ORG   0000H
MAIN:   MOV   SP, #60H
        MOV   TMOD, _____          (0.5point)
        MOV   TL0, #E7H
        MOV   TH0, #E7H
LOOP:   SETB  _____                (0.5point)
LOOP1:  _____, LOOP1               (1point)
        CLR   TR0
        ____  P1.3                 (0.5point)
        CLR   ____                 (0.5point)
        SJMP  _____                (0.5point)
        _____                      (0.5point)
```

The frequency of the square wave is: (2 points)

Problem 6 (5 points)

Program timer 1 is used to be an event counter. Set the initial count to 10. Use mode 1 and display the binary count on P1 and P2 continuously until the count reaches 0000H.

```
        MOV   TMOD , ___           (1point)
        MOV   TH1, ____            (0.5point)
        MOV   TL1, ____            (0.5point)
        SETB  ____                 (1point)
LOOP:   MOV   A, TL1
        MOV   P1, A
        MOV   A, TH1
        MOV   P2, A
        ____  ____, LOOP           (1point)
        CLR   ____                 (0.5point)
        CLR   TF1
        _____                      (0.5point)
```

Problem 7 (4 points)

Calculate the total number of bits transferred if 100 pages of ASCII data are sent using asynchronous serial data transfer. Assume a data size of 8 bits, 1 stop bit, no parity. Assume each page has 48×20 of text characters. How long will the data transfer take if the baud rate is 9600?

Solution:

Problem 8 (10 points)

The following program is written for the 8051 to get data from P1 and send it to P2 continuously while incoming data from the serial port is send to P0. Assume crystal frequency to be 11.0592MHz and SMOD = 1. Set the baud rate at 4800. Calculate the initial value in TH1. Fill in the following blanks. (Hint: SMOD = 0, baud rate at 9600, then TH1 = FD).

```
        ORG   0000H
        _____________      1 point
        ORG   0023H
        _____________      1 point

        ORG   0030H
```

MAIN:	**MOV**	**IE, _____**	0.5 point
	MOV	**P1,_____**	0.5 point
	MOV	**TMOD,_____**	0.5 point
	MOV	**TH1,_____**	
	MOV	**SCON,_____**	0.5 point
	SETB	**_____**	0.5 point
HERE:	**MOV**	**P2, P1**	
	SJMP	**HERE**	
SP_ISR:		**_____, TRANS**	0.5 point
	MOV	**P0,_____**	0.5 point
	CLR	**_____**	0.5 point
	RETI		
TRANS:	**CLR**	**_____**	0.5 point
		_____	0.5 point
	END		

The initial value in TH1 should be: (3 points)

Problem 9 (10 points):

Answer the following questions:

(1) In the 8051 which port provides the A0 – A7 address bits? (1 point)

(2) In the 8051 which port provides the A8 – A15 address bits? (1 point)

(3) In the 8051 which port provides the D0 – D7 data bits? (1 point)

(4) Which signal must be used in fetching data from external RAM?

(a) RD (b) WR (c) PSEN (1 point)

(5) Write a program to transfer 100 bytes of data from external data ROM to external data RAM. The external data ROM address is 3000H, and the external data RAM starts at 8000H. (Hint: the address of DPL is 82H) (6 points)

Solution:

(1)

(2)

(3)

(4)

(5)