DEPATMENT OF COMPUTER ENGINEERING
UNIVERSITY OF BENIN, BENIN CITY
2018/2019 B.ENG EXAMINATION

CPE575: MICROPROGRAMMING

TIME : 3 HOURS 13/07/2019

ATTEMPT ANY FOUR (4) QUESTIONS ONLY

1a. An engineer need to send temperature readings from a reactor to a laptop computer sequentially using 9-bit UART communication technique at a baudrate of 9600. The oscillator frequency of the microcontroller in the reactor is 11.059Mhz. Write an 8051 assembly language program that transmits 16 bytes of temperature data stored in external data memory starting at address 8000H. (6 Marks)

b. Using appropriate diagrams, briefly describe the serial port of the 8051 microcontroller. (4 Marks)

c. An interrupt-driven-system gives an illusion of doing many things simultaneously. Explain. (5 Marks)

d Consider the instruction: MOV SCON, #42H. Explain the consequential effect of the instruction on system operation. (5 Marks)

2a Write a program segment that uses timer 1 in Mode 2 to toggle P1.0 once whenever the counter reaches a count of 100. Assume the timer clock is taken from external source P3.5 (T1). (6 Marks)

2b Explain briefly the following three (3) addressing modes for 8051 and give two (2) examples each.

i. Direct addressing mode

ii. Register indirect addressing mode

iii. Indexed addressing mode (6 Marks)

2c Ten numbers are stored in the 8051 internal RAM starting at address 4FH. Assuming that their sum will not overflow the accumulator. (8 Marks)

i. Write an algorithm outlining how this can be achieved

ii Draw a flowchart based on the written algorithm

iii Write an assembly program that implements the flowchart drawn

3a Write an 8051 assembly language program that sequentially transfers 16 bytes of data stored in external data memory starting at address 8000H to internal RAM starting at address 40H. (8 Marks)

3b Write a program that generates 100Hz pulses on P3.1 with 60% duty cycle. (12 Marks)

4a Explain how the 8051 microcontroller accesses RAM and ROM. (5 Marks)

4b Explain the internal memory of 8051 microcontroller (memory) organization. (9 Marks)

4c Assume RAM locations 40h – 42h have the following values: 40h = 7Dh, 41h = EBh, 42h = C5h. Write a program to find the sum of the values in these locations. At the end of the program register A should contain the low byte and register 7 should contain the high byte. (6 marks)

5a Four speakers (SPK 1, SPK 2, SPK 3, SPK 4) are connected to Port 3 of the 8051 microcontroller and are sequentially buzzed for 1s with 0.01s inter-speaker switching time.

i. Sketch the circuit described

ii. Write an assembly language program to implement the circuit specified (10 Marks)

5b Show the multiplication process for 5423 * 8761 (10 Marks)

i. Outline an algorithm for this multiplication

ii. Write a program that implements this multiplication

iii. Create a multiplication subroutine from the program you have written

iv. Use the subroutine to multiply 6622 * 6543

6. Design a 50Hz PWM signal with 40% duty cycle using 8051 timers and interrupt. [Tip: present a detailed design showing all calculations, algorithms, programs etc.] (20 Marks)

Goodluck!

DEPARTMENT OF COMPUTER ENGINEERING,
UNIVERSITY OF BENIN, BENIN CITY
2018/2019 B.ENG CONTINOUS ASSESSMENT

CPE 575: Microcontroller Programming TIME: 1HOUR 11/04/2018

ATTEMPT ALL QUESTIONS

1a. Write a program that generates 100Hz square wave on P1.0 of the 8051

b. Describe the 8051 bit memory address space.

2a. Outline the sequence of events that occur when an interrupt is triggered.

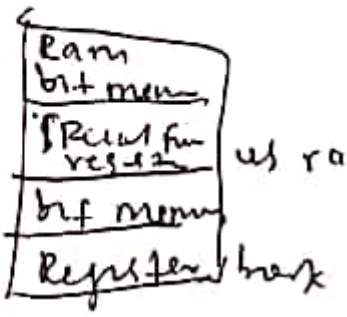
b Fully describe the structure of the 8051 internal RAM

3a. Consider the following instructions.
i MOV A, @DPTR ii MOV A, #60H .
I Describe the coding for the addressing modes used for each instruction
II Explain what each instruction will do when executed

b show the multiplication process for 5423 x 87
I outline an algorithm for this multiplication
II write a program that implements this multiplication
III Create a multiplication subroutine form the program you have written

4a. Sketch the serial port buffer register.

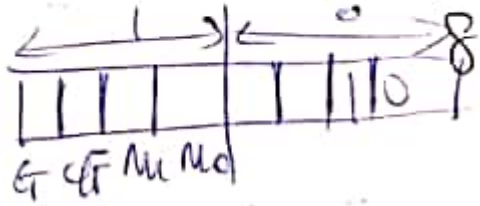
b. Explain: i. The concept of polling in microcontrollers ii Polling sequence



EX0
TM0
EX1
TM1
RI & TI

$TH1 = \frac{-10^6}{2XF} = \frac{10^6}{2X160} =$

54 27



1a.
```
ORG 8100
MOV TMOD, #01H ; 16bit reload.
MOV TH0, #-5000 ; -5000 reload value in TH0.
SETB TR0 ; start timer
JNB TF0, LOOP ; wait for overflow
CLR TF0 ; clear time overflow flag
; toggle port bit
```

B.Eng Exams

UNIBEN Computer Engineering, 2015/2016

DEPATMENT OF COMPUTER ENGINEERING,
UNIVERSITY OF BENIN, BENIN CITY
2015/2016 B.ENG SESSIONAL EXAMINATION

CPE575: Microcontroller Programming

04/03/16

TIME : 3 HOURS

ATTEMPT ANY FIVE (5) QUESTIONS ONLY

1a. Consider the following instructions:

i. MOV A,@RI
INC R7

ii. MOVX A, @DPTR

iii. MOVC A, #60H

iv.

I. Describe the coding for the addressing modes used for each instruction.
II. Explain what each instruction will do when executed. *(6 Marks)*

b. It is required to use Timer 1 to create 200 Hz square wave on P3.1.
i. Draw a flowchart showing how this task can be accomplished.
ii. Write a program for implementation on the 8051 microcontroller for the flowchart. *(8 Marks)*

2a. State and explain the clocking sources for the 8051 internal timers *(4 Marks)*

b. Write a program that generates 1KHz pulses on p3.1 with 60% duty cycle *(10 Marks)*

3a. Sixteen (16) signed binary numbers are stored in the 8051's internal RAM consecutively starting at RAM location 60H. Write an assembly language program that sequentially examines these numbers and performs serial transmission of the number in mode 1, with even parity, whenever any of the numbers is a positive number. *(10 Marks)*

b. Describe the structure of the first 32 bytes of the 8051 internal RAM. *(4 Marks)*

4ai. Add comments to program Qn4a

ii. Explain how the program will work when executed *(10 Marks)*

b. Consider the instruction: MOV TMOD, # 63H

i. What does this instruction do when executed?

ii. Explain the consequential effect of the instruction on system operation. *(4 Marks)*

5a. A computer monitors an industrial process and is used to find the average of a relatively large number of temperature and pressure readings. The temperature readings are stored as one block of data in external rate memory starting at address 2000H while the pressure readings are also shred as a block of data in external data memory starting at address 3000H.

i. Assuming that a hundred readings each are taken for both temperature and pressure, write a program that calculate both averages. (Hint: Use one subroutine for both averages and assume that the readings are values above a minimum below which no readings fall so that the sum does not overflow the accumulator)

ii. Draw a flowchart that transfers the block of temperature readings to another block starting at address 5000H. Write a program to implement the transfer. *(12 Marks)*

c. Sketch the 8051 serial port buffer register (SBUF). *(2 Marks)*

6a. Two Four fanciful lighting bulbs, orange and green, for use at an am connected to p1.0 and p1.1 of the 8051 microcontroller. Write an a that alternately turns them on for 5s each with a 0.1s wait period befo another using interrupts. *(10 Marks)*

b. An interrupt-driven-system gives an illusion of doing many things simultaneo *(4 Marks)*

7ai. Show the multiplication process for 5423 x 87

ii. Outline an algorithm for this multiplication

iii. Write a program that implements this multiplication.

iv. Create a multiplication subroutine from the program you have written.

v. Use the subroutine to multiply 6622 x 65 *(12 Marks)*

b. Sketch the PSW of the 8051. *(2 Marks)*

PSW7	PSW6	PSW5	PSW4	PSW3	PSW2	PSW1	PSW
CY	AC	F0	RS1	RS0	OV		P

CY AC F0 RS1 RS0 OV — P

PROGRAM QN4a

```
0000
0000 020030          5
                     6          ORG 0
                     7          LJMP MAIN
0003 C297            8   EX0ISR: CLR P1.1
0005 32              9          RETI
0013                 10         ORG 0013
0013 D297            11  EX1ISR: SETB P1.1
0015 32              12         RETI
0030                 13         ORG 30H
0030 75A885          14  MAIN:  MOV IE, #85H
0033 D288            15         SETB IT0
0035 D28A            16         SETB IT1
0037 D297            17         SETB P1.1
0039 20B202          18         JB P3.2, SKIP
003C C297            19         CLR P1.1
003E 80FE            20  SKIP:  SJMP $
                     21         END
```

; Ext 0 vector at 0003
; turn furnance off.

; turn furnace on

; enable external interrup
; negative edge triggered.

; turn furnace off.
; if T > degrees
; turn furnace off
; do nothing.

Goodluck