Quiz

1. Given two decimal numbers A = 247 and B = 89

(a) convert A and B into unsigned binary numbers and show the calculation of A ÷ B

```
          10
1011001 ) 11110111
          1011001
            1000101
```

Quotient = 10, Remainder = 1000101

(2 marks)

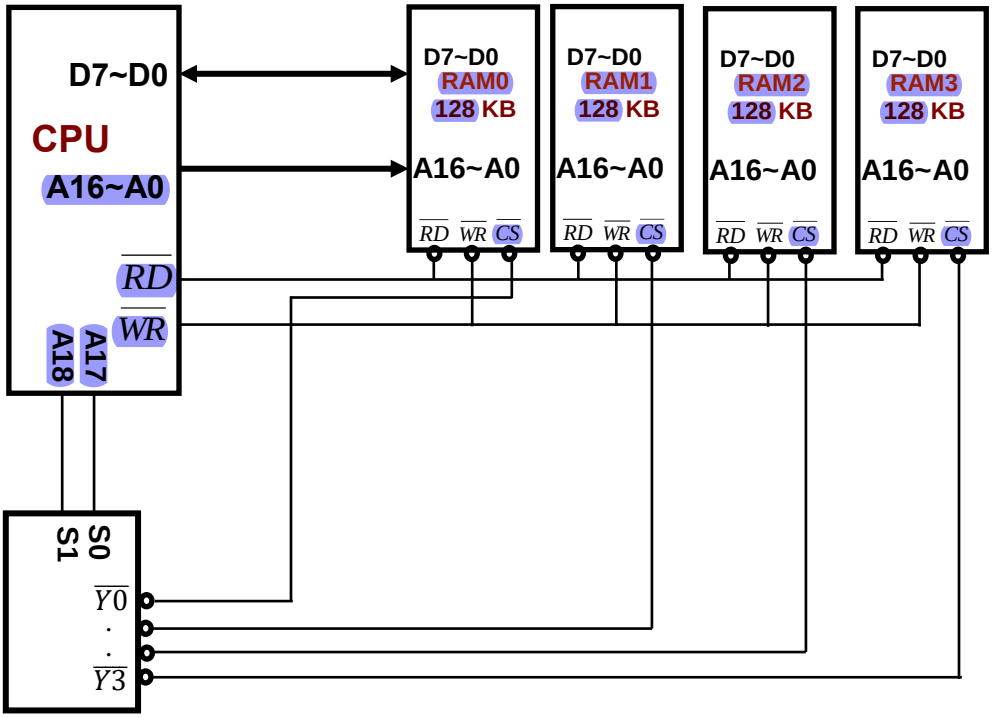
(b) convert A and B into BCD codes and show the calculation of A + B

```
  0010 0100 0111
+      1000 1001
  0010 1101 0000
+      0110 0110
  0011 0011 0110
```

(2 marks)

2. In a given byte-addressable computer with a 19-bit address bus, memory locations 00000h to 7FFFFh are available for user programs. Each memory chip is 128 KB. Draw a diagram to show the connection of CPU, memory chips and address decoder circuit. Assume each memory chip demands active low memory read, memory write and chip select signals.

(4 marks)



3. Write a program to perform the following tasks:

- set up PORT D as an output port
- output a sequence of 8 hexadecimal numbers to PORT D, the eight numbers are the eight digits (from the first digit to the last digit) of your student ID number
- calculate the sum of all digits of your student ID number
- the sum is stored in a label defined as location **X**0, **X** is the last digit of your student ID number plus one
- the program should show the final result forever
- the program must have sufficient comments

(a) copy the program from the editor window

```
    LIST P=18F4520          ;directive to define processor
    #include <P18F4520.INC> ;CPU specific variable
                            ;student ID number is 12345678

    sum equ 0x90
    org 0H                  ;start at address 0
    movlw 0x00
    movwf TRISD,0           ;set PORT D to output
    movlw 0x01
    movwf sum
    movwf PORTD             ;output 1st digit
    movlw 0x02
    addwf sum,f
    movwf PORTD             ;output 2nd digit
    movlw 0x03
    addwf sum,f
    movwf PORTD             ;output 3rd digit
    movlw 0x04
    addwf sum,f
    movwf PORTD             ;output 4th digit
    movlw 0x05
    addwf sum,f
    movwf PORTD             ;output 5th digit
    movlw 0x06
    addwf sum,f
    movwf PORTD             ;output 6th digit
    movlw 0x07
    addwf sum,f
    movwf PORTD             ;output 7th digit
    movlw 0x08
    addwf sum,f             ;sum of all digits
    movwf PORTD             ;output last digit
B1: goto B1
    end
```

(b) copy the contents of PORT D and sum when the program finished

Address	Symbol Name	Value
F83	PORTD	0x08
090	sum	0x24

(8 marks)

Program 6 marks, no comments, deduct 1 mark.