UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DEE 2133
COURSE	: MICROCONTROLLER
SEMESTER/SESSION	: 1 - 2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **4** questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 10 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) Convert binary number into decimal number.

(i) 1000100_2 (2 marks)

(ii) 1011110011_2 (2 marks)

b) State the different between microcontroller and microprocessor. (4 marks)

c) Show **five (5)** assembly instruction used in 8051 microcontroller. (5 marks)

d) Show the status of **CY**, **AC** and **P** flag after the addition of 38H and 2FH in the following instructions.

```
MOV A, #38H
ADD A, #2FH
```

(5 marks)

e) Show the description for the following assembler directives:

i) `ORG` (2 marks)

ii) `END` (2 marks)

f) Name the following register bank based on **PSW.4** and **PSW.3** logic state.

Table 1

PSW.4	PSW.3	Bank
0	1	.....
1	0	.....
1	1	.....

(3 marks)

QUESTION 2

a) List **three (3)** 8051 conditional jump assembly language instruction. (3 marks)

b) Write the description for the following jump instruction on Table 2.

Table 2

Instruction	Description
DJNZ	.....
JB	.....
JBC	.....

(3 marks)

c) Compute the **delay** generated from the program below. Given the Crystal frequency=11.0592MHz.

```
DELAY:  MOV R2,#200
AGAIN:  MOV R3,#250
HERE:   NOP
        NOP
        DJNZ R3,HERE
        DJNZ R2,AGAIN
        RET
```

(5 marks)

d) Table 3 shows the clocks per machine cycle for various 8051 versions.

Table 3

Chip Maker	Clocks per Machine Cycle
AT89C51 Atmel	12
P89C54X2 Philips	6
DS5000 Dallas Semi	4
DS89C420/30/40/50 Dallas Semi	1

Compute the time period of the machine cycle for the following chip maker.

i) AT89C51 (2 marks)

ii) P89C54X2 (2 marks)

iii) DS5000 (2 marks)

e) Illustrate the *basic circuit* schematic diagram of AT89C51 microcontroller. (*Use attached paper at the attachment*)

(5 marks)

f) Give **three (3)** additional function at Port 3 of 8051 microcontroller. (3 marks)

QUESTION 3

a) Produce a program to turn **ON** and **OFF** from AT89C51 pin P1.3 with 500ms delay.

(5 marks)

b) A switch (SPDT) is connected to pin P1.5 of AT89C51 and LED to pin P2.7. Produce a program to get the status of the switch and indicate it at LED.

(4 marks)

c) Show the status of register 'A' and 'B' after the multiplication of 25H and 65H in the following instruction.

```
MOV A,#25H
MOV B,#65H
MUL AB
```

(4 marks)

d) Show the status of register 'A' and 'B' after the division of 95H and 10H in the following instruction.

```
MOV A,#95
MOV B,#10
DIV AB
```

(4 marks)

e) A two (2) switch (SPDT) is connected to pin P2.1 and P2.2 of AT89C51 and LED to pin P3.0. Produce a program to turn ON LED if the logic of both switches is LOW. LED is OFF when both switches are HIGH.

(8 marks)

f) Show the results of AND operation between 36H and 0FH. (4 marks)

g) Show the results of OR operation between 03H and 64H. (4 marks)

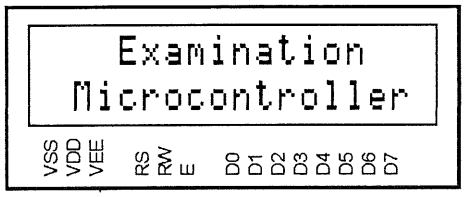
QUESTION 4

a) Illustrate the schematic diagram consisting of one (1) 16x2 LCD display and one (1) pushbutton including basic circuit and all necessary labelling. (*Use attached paper at the attachment*)

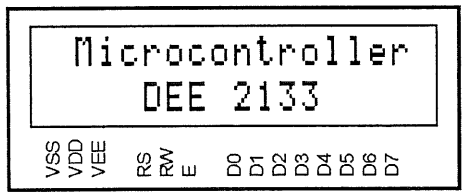
(6 marks)

b) Produce a program achieve the following task:

When Pushbutton pressed, LCD displayed as follows.



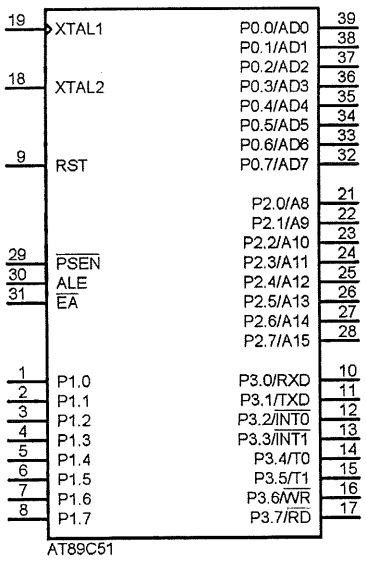
When Pushbutton is released, LCD displayed as follows.



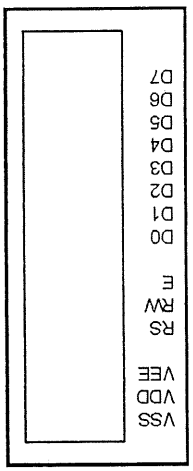
(11 marks)

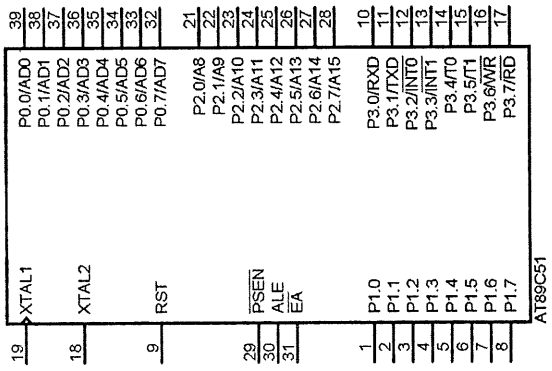
----------**End of question**----------

ATTACHMENT 1 : Illustrate your answer for question 2.e)



ATTACHMENT 2 : Illustrate your answer for question 4.a)





ATTACHMENT 3 : CODE FORMATTING

Declaration

```
#define xxxx P2

sbit yyyy at P2_3_bit;

int zyzy;
```

Prototype

```
void xyxyx();
```

LCD

```
Lcd_Init();

Lcd_Cmd(_LCD_CLEAR);

Lcd_Cmd(_LCD_CURSOR_OFF);

LCD_Out(1,4,word1);
```

Others

```
void main()
{
   while(1)
   {

   }
}
------------------------------

if(suis==1)
{

}
else
{

}
------------------------------

for(int i=0; i>8; i++)
{

}
------------------------------

if(suis1==1)
{

}
if(suis2==1)
{

}
else
{

}
------------------------------

while(suis==0)
{

}
------------------------------
```

ATTACHMENT 4 : LCD Command

LCD Command	Purpose
_LCD_FIRST_ROW	Move cursor to the 1st row
_LCD_SECOND_ROW	Move cursor to the 2nd row
_LCD_THIRD_ROW	Move cursor to the 3rd row
_LCD_FOURTH_ROW	Move cursor to the 4th row
_LCD_CLEAR	Clear display
_LCD_RETURN_HOME	Return cursor to home position, returns a shifted display to its original position. Display data RAM is unaffected.
_LCD_CURSOR_OFF	Turn off cursor
_LCD_UNDERLINE_ON	Underline cursor on
_LCD_BLINK_CURSOR_ON	Blink cursor on
_LCD_MOVE_CURSOR_LEFT	Move cursor left without changing display data RAM
_LCD_MOVE_CURSOR_RIGHT	Move cursor right without changing display data RAM
_LCD_TURN_ON	Turn LCD display on
_LCD_TURN_OFF	Turn LCD display off
_LCD_SHIFT_LEFT	Shift display left without changing display data RAM
_LCD_SHIFT_RIGHT	Shift display right without changing display data RAM