

2nd Semester, 2021/2022

Course Code: CSE 211s

Time allowed: 2 Hrs.

INTRODUCTION TO EMBEDDED SYSTEMS

The Exam Consists of 60 Questions in 4 Pages.

Maximum Marks: 110 Marks

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تعليمات هامة

• حياة التليفون المحمول مفتوحا داخل لجنة الامتحان يعتبر حالة غش تستوجب العقاب وإذا كان ضروري الدخول بالمحمول فيوضع مغلق في الحقائب.

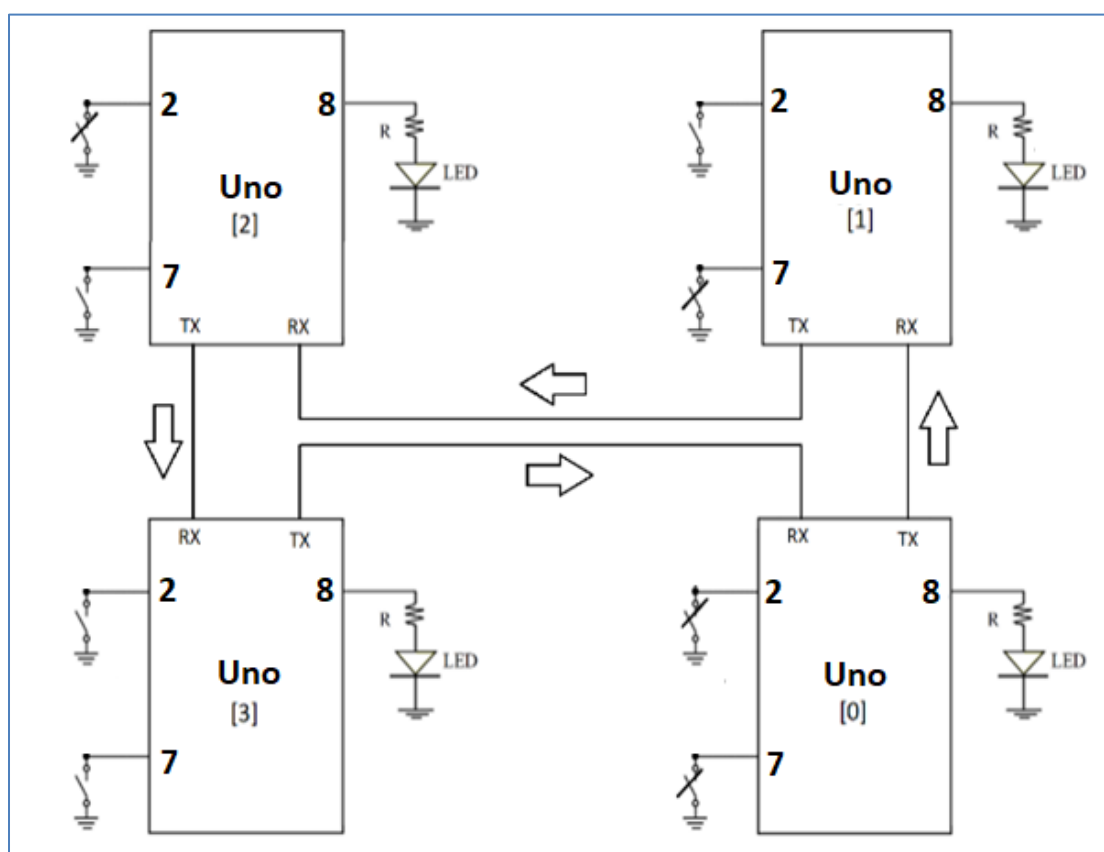
• لا يسمح بدخول سماعة الأذن أو البلوتوث.

• لا يسمح بدخول أي كتب أو ملازم أو أوراق داخل اللجنة والمخالفة تعتبر حالة غش.

**On your answer bubble sheet,
mark Exam Model as A**

For each of the following 16 multiple choice questions (MCQs), select ONLY the ONE correct answer.

Mark your choice on the answer bubble sheet..... [The 16 MCQs are equal in weight]



Q1—Q16: Four Arduino Uno are connected in a ring using UART, as shown in the figure to the right. The transmitter line of one microcontroller is connected to the receiver line of its neighbor to form a ring. Each microcontroller defines a unique address for itself using two dip switches connected to pin 2 (least bit) and 7. Exchanged messages consist of 3 characters; first character defines the sender address; second one defines the receiver address; and the third defines the receiver LED state to set to. As an example, if microcontroller 0 wants to switch on the LED on microcontroller 2, the message will be "021" and to switch it off, the message should be "020". When receiving a message, a microcontroller checks the second character, if it matches its address, then the microcontroller should apply the received setting to its LED; otherwise, the microcontroller forwards the message to its neighbor. If a message comes back to its sender that means that the receiver address does not match any microcontroller on the ring and that message should be dropped. PROG1 is running on each microcontroller. In PROG1, each microcontroller tries to switch its LED ON through the ring connection. Some statements in PROG1 are not in the right order.

MICROPROCESSORS BASED SYSTEMS

The Exam Consists of **60** Questions in **4** Pages.

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1. In PROG1 line 2, statement <V1> should be

A) 0	B) 2	C) 7	D) 8
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2. In PROG1 line 5, statement <V2> should be

A) 0	B) 2	C) 7	D) 8
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3. In PROG1 line 12, statement <TYPE1> should be

A) INPUT	B) OUTPUT	C) INPUT_PULLUP	D) DIGITAL_INPUT
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4. In PROG1 line 13, statement <TYPE2> should be

A) INPUT	B) OUTPUT	C) INPUT_PULLUP	D) DIGITAL_OUTPUT
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5. In PROG1 line 14, statement <TYPE3> should be

A) INPUT	B) OUTPUT	C) INPUT_PULLUP	D) DIGITAL_INPUT
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6. In PROG1, the correct order for lines 18—21 should be

A) 21-20-18-19	B) 19-20-18-21	C) 19-18-21-20	D) 20-18-21-19
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7. In PROG1, line 18-21, statement <X> should be

A) 0	B) '0'	C) 1	D) '1'
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8. In PROG1, line 19, expression <EXPR1> should be

A) (2*v0 +3*v1)	B) (v0 +v1)	C) (v1+(v0<<1))	D) (v0+(v1<<1))
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9. In PROG1, line 24, condition <C1> should be

A) Serial.available() > 0	B) Serial.available() < 1	C) Serial.available() == 0	D) Serial.available() ==2
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10. In PROG1, line 27, condition <C2> should be

A) Serial.available() == 0	B) Serial.available() == 1	C) Serial.available() == 2	D) Serial.available() > 0
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11. In PROG1, line 28, condition <C3> should be

A) Serial.available() == 0	B) Serial.available() == 1	C) Serial.available() == 2	D) Serial.available() >0
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12. In PROG1, line 29, expression <EXPR2> should be

A) myAdd+'1'	B) myAdd+'0'	C) myAdd+0	D) myAdd
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13. In PROG1, line 30, condition <C4> should be

A) LED_state==OFF+0	B) LED_state==OFF+1	C) LED_state==ON+'0'	D) LED_state==ON+0
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14. In PROG1, line 33, expression <EXPR3> should be

A) TranAdd	B) RecAdd	C) LED_state	D) TranAdd+'0'
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15. In PROG1, line 34, expression <EXPR4> should be

A) TranAdd+'0'	B) RecAdd	C) LED_state+0	D) TranAdd+'0'
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16. In PROG1, line 35, expression <EXPR5> should be

A) LED_state + '0'	B) RecAdd	C) LED_state	D) TranAdd+'0'
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PROG1 Q1—Q15

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1  #define PIN0 2
2  #define PIN1 <V1>
3  #define ON 1
4  #define OFF 0
5  #define PIN2 <V2>
6  byte v0;
7  byte v1;
8  byte myAdd;
9  byte TranAdd, RecAdd, LED_state;
10 void setup() {
11     Serial.begin(9600);
12     pinMode(PIN0, <TYPE1>);
13     pinMode(PIN1, <TYPE2>);
14     pinMode(PIN2, <TYPE3>);
15     v0 = digitalRead(PIN0);
16     v1 = digitalRead(PIN1);
17
18     Serial.write(myAdd + <X>);
19     myAdd = <EXPR1>;
20     Serial.write(ON + <X>);
21     Serial.write(myAdd + <X>);
22 }
23 void loop() {
24     if (C1)
25     {
26         TranAdd = Serial.read();
27         while (<C2>) ; RecAdd = Serial.read();
28         while (<C3>) ; LED_state = Serial.read();
29         if (RecAdd == <EXPR2>) {
30             if (<C4>) digitalWrite(PIN2, ON);
31             else digitalWrite(PIN2, OFF);
32         } else {
33             Serial.write(<EXPR3>);
34             Serial.write(<EXPR4>);
35             Serial.write(<EXPR5>);
36         }
37     }
38 }

```

C	B	A	C	B	A	A	A	C	B	C	B	C	C	D	C
Q16	Q15	Q14	Q13	Q12	Q11	Q10	Q9	Q8	Q7	Q6	Q5	Q4	Q3	Q2	Q1

MODEL ANSWER

```

1  #define PIN0 2
2  #define PIN1 7
3  #define ON 1
4  #define OFF 0
5  #define PIN2 8
6  byte v0;
7  byte v1;
8  byte myAdd;
9  byte TranAdd, RecAdd, LED_state;
10 void setup() {
11     Serial.begin(9600);
12     pinMode(PIN0, INPUT_PULLUP);
13     pinMode(PIN1, INPUT_PULLUP);
14     pinMode(PIN2, OUTPUT);
15     v0=digitalRead(PIN0);
16     v1=digitalRead(PIN1);
17     myAdd=(v0+(v1<<1));
18     Serial.write(myAdd+'0');
19     Serial.write(myAdd+'0');
20     Serial.write(ON+'0');
21 }
22 void loop() {
23     if (Serial.available() > 0)
24     {
25         TranAdd = Serial.read();
26         while (Serial.available() == 0) ;    RecAdd = Serial.read();
27         while (Serial.available() == 0) ;    LED_state = Serial.read();
28         if(RecAdd==myAdd+'0'){
29             if(LED_state==ON+'0') digitalWrite(PIN2,ON);
30             else digitalWrite(PIN2,OFF);
31         }else{
32             Serial.write(TranAdd);
33             Serial.write(RecAdd);
34             Serial.write(LED_state);
35         }
36     }
37 }
38

```

END of Exam

Examination Committee

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Dr. Ahmed M. Zaki.

Exam Date: 21st of May, 2022