Faculty of Engineering, Ain Shams University, Spring 2022, Midterm Exam

Introduction to Embedded Systems, CSE211s - (Time 50 Minute) (Model A)

Q1: What is the expected output on virtual terminal of the following code:

```
Serial.print(12,BIN);Serial.print(12,HEX);Serial.print(12,DEC);
```

A. 1100 C 12

B. 1100C12

C. 12C1100

D. 121212

Following program contains incorrect code. It should toggle a LED whenever a push button connected to the pull up pin is pressed.

```
1  void setup() {
2      pinMode (13, OUTPUT);
3      pinMode(7, INPUT);
4      digitalWrite (7, LOW);
5  }
6  int oldValue = HIGH;
7  int state = LOW ;
8  void loop() {
9  int value = digitalRead (7);
10 if(value!=HIGH && oldValue==LOW) {
11     state = (state==LOW) ? LOW : HIGH;
12 }
13 digitalWrite (13, state);
14 value = oldValue;
15 }
```

Q2: For line 4 the correct code is:

A. digitalRead (7, LOW);

B. digitalWrite (7, HIGH);

C. digitalWrite (13, LOW);

D. digitalWrite (13, HIGH);

Q3: For line 10 the correct code is:

A. if(value!=LOW && oldValue!=HIGH) {

B. if(value!=HIGH AND oldValue==LOW) {

C. if(value==LOW && oldValue==HIGH) {

D. if(value==LOW && oldValue==HIGH && state==LOW) {

Q4: For line 11 the correct code is:

A. state = (state==HIGH) ? LOW : HIGH;

B. state = (state==LOW) : LOW ? HIGH;

C. state = (state==LOW && oldState==LOW) ? LOW : HIGH;

D. state = (oldState==HIGH AND state==LOW) ? LOW : HIGH;

Q5: The scope of variable oldValue is:

A. global

B. local

C. static

D. public

Q6: There is also additional mistake in line:

A. 2
B. 6
C. 9
D. 14

Following program contains incorrect code. It should toggle a LED every 500 ms.

```
1  #include <MsTimer2.h>
2  void flash() {
3      boolean output = HIGH;
4      digitalWrite(13, output);
5      output = (output)?HIGH:LOW;
6  }
7  void setup() {
8      pinMode(13, OUTPUT);
9      MsTimer2::set(500);
10     MsTimer2::start();
11 }
12 void loop() {
13 }
```

Q7: For line 10 the correct code is:

A. MsTimer2::flash();
B. flash();
C. MsTimer2::start(flash);
D. Move to line 13

Q8: For line 3 the correct code is:

A. boolean output = 0;
B. static boolean output = HIGH;
C. global boolean output = HIGH;
D. boolean output = LOW;

Q9: For line 5 the correct code is:

A. No change is required.
B. output = (output)?LOW:HIGH;
C. output = not(output);
D. output = LOW;

Q10: Arduino allows timers for that reason it is called:

A. Real-Time system
B. Time-Based system
C. Interrupt enabled system
D. Clock-Based system

Following program reads analog value and displays the 10 Bits binary value using 10 LEDs.

```
1  void setup(){
2      for (int i=2;i<12; i++)
3          pinMode (i, OUTPUT);
4      analogReference (EXTERNAL);
5  }
6  void loop() {
7      int value = digitalRead (0);
8      for(int i=0;i<10; i) {
9          digitalWrite (i, value&0x1);
10
11     }
12 }
```

Q11: For line 8 the correct code is:

A. for (int i=2;i<12; i) {
B. for (int i=2;i<=11; i++) {
C. for (int i=0;i<10; i++) {
D. for (int i=2;i<10; i++) {

Q12: For line 7 the correct code is:

A. int value = analogRead (1);
B. value = analogRead (0);
C. byte value = analogRead (0);
D. int value = digitalRead (1 to 10);

Q13: The missing code at line 10 is:

A. value <<= 1;
B. value /= 2;
C. value -= 1;
D. value += 2;

Q14: In Arduino UNO in order to produce an equivalent analog output the following feature can be used:

A. Use the internal ADC module
B. Use the internal DAC module
C. Use the internal PWM module
D. Use external ADC module

Complete the following program inorder to produce 50% PWM signal at pin 3.

```
1  void setup(){
2
3  }
4  void loop()  {
5
6  }
```

Q15: The missing code at line 2 is:

A. pinMode (3, OUTPUT);
B. pinMode (3, INPUT);
C. pinMode (3, ANALOG);
D. pinMode (3, PWM);

Q16: The missing code at line 5 is:

A. digitalWrite(3, 128);
B. pwmWrite(3, 0.5);
C. analogWrite(3, 128);
D. analogWrite(3, 50);

Q17: LDR is a sensor used for:

A. Measuring Light Intensity
B. Line Detection
C. Detection of object motion in Long Distance Ranges
D. None of the above.

Q18: For Arduino the pulseIn(3, HIGH) can be replaced by following code:

A. while(digitalRead(3)==HIGH);
B. while(digitalRead(3)==LOW);
C. digitalWrite(3, LOW); digitalWrite(3, HIGH); delay(10); digitalWrite(3, LOW);
D. digitalWrite(3, HIGH); digitalWrite(3, LOW); delay(10); digitalWrite(3, HIGH);

Following code is used to calculate the corresponding y value from the lookup table given x value.

```
1 int lookup (int x, int xStart, int xStep, int yValues[], int nYValues)
2 {
3     if (x > (xStart + xStep* (nYValues-1))) return (...);
4     if (x < xStart) return yValues (...);
5     int index = (x - xStart) / xStep;
6     float fraction = (...);
7     return (int) (yValues[index] - fraction * (yValues [index] - yValues[index+1]));
8 }
```

Q19: Complete the missing code at line 3:

A. yValues[0]
B. yValues[nYValues]
C. yValues[nYValues-1]
D. 0

Q20: Complete the missing code at line 4:

A. yValues[0]
B. yValues[nYValues]
C. yValues[nYValues-1]
D. 0

Q21: Complete the missing code at line 6:

A. float(x - (index * xStep + xStart)) /(xStep)
B. (x - index * xStep - xStart) /xStep
C. (x - index * xStep - xStart) /float (nYValues)
D. (x - index - xStep - xStart) /float (xStep)

Q22: Which of the following sentence are correct:

A. Arduino supports one hardware-based serial, multiple software-based serial interfaces
B. Arduino supports one hardware-based serial, one software-based serial interfaces
C. Arduino supports only one hardware-based serial interface
D. Arduino supports only one software-based serial interface