

Midterm 1: CST8227 Interfacing

Winter 2011

Time: 50 minutes; Total Marks available: 25 marks

(Allocation of marks is shown beside each question)

Instructions:

1. BEFORE answering any questions, please check that your copy of the test has all pages (as indicated in the footer at the bottom of each page). Please read all questions carefully, then answer the question below first!
2. Be sure to **mark your name** on all pages of this midterm.
3. All work necessary for finding your answer should be shown on this test paper. If you do **not** show your work, **you will not get any marks!!**
4. No calculators are allowed. Numbers have been chosen to work out conveniently. Maybe you'd be better working in fractions instead of decimal values?
5. If you are uncertain what a question is asking, make reasonable assumptions, write those assumptions down on this test paper, and continue answering the question.

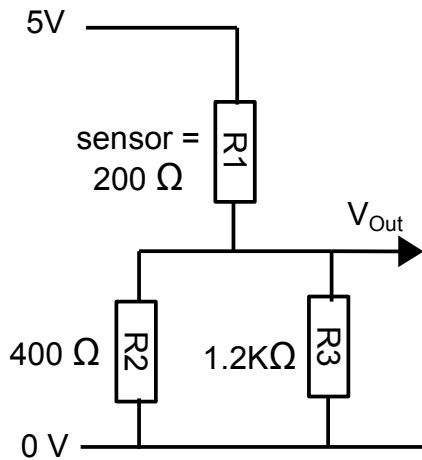
What is your:

NAME? _____

Student Id? _____

(Continued on next page)

1. [8 marks] Consider the following circuit where a sensor (R1) is combined with two additional resistors (R2, R3). Calculate all values for resistance, current and voltage; remember to give the correct units (ie. ohms, amps/milli-amps, or volts). **Show all your work** on the last page.



- Net resistance = _____
- Total current from 5V supply = _____
- Voltage across R1 = _____
- Current through R1 = _____
- Voltage across R2 = _____
- Current through R2 = _____
- Voltage across R3 = _____
- Current through R3 = _____

2. [1 mark] What is the resistance, in ohms, of a resistor whose colour bands are: brown, orange, red, gold?

3. [1 mark] What colour bands would appear on a 1.2KΩ resistor?

4. [1 mark] The most recent version of Java Micro Edition (as of Jan 2011) is built around which version of Java?

5. [1 mark] During this course, we have examined and discussed the spectrum of capabilities and features found in embedded and mobile systems. The minimum hardware requirements specified for CLDC were also presented. Within the spectrum of embedded devices, **clearly** identify **all** categories that meet the requirements for CLDC.

6. [1 mark] Is the Arduino system a multi-tasking system?

7. [1 mark] The program listed below successfully compiles and loads onto an Arduino, but nothing appears in the serial monitor. **Clearly** identify the problem and/or fix the program.

```
void setup() {  
  pinMode(2, INPUT);  
}  
  
void loop() {  
  int sensorValue = digitalRead(2);  
  Serial.println(sensorValue, DEC);  
}
```

8. [1 mark] Give a **clear** definition of the term "analog" when referring to electronic signals.

9. [1 mark] Give a **clear** definition of the term "digital" when referring to electronic signals.

10. [1 mark] **Clearly** describe the type(s) of analog output available on the Arduino.

11. [1 mark] What is the largest value that can be stored in an `int` on the Arduino?

12. [2 marks] Write the essential Arduino code to display the size (in bytes) of `float` variables.

13. [2 marks] A student writes a test program which successfully compiles, loads, and is completely functional. The compiler correctly reports "Binary sketch size: 2248 bytes". A few lines of the program are reproduced below. Later the student increases the array of stored values to: `int sensorValues[500];` but notices that the compiler **still** reports "Binary sketch size: 2248 bytes". **Clearly** explain what the problem is, a suitable fix, or why this is not a problem.

```
/* ... additional program code goes here ... */

void loop() {
  int sensorValues[10];
  ../* ... remainder of program ... */
}
```

14. [3 marks] Do you remember the lab work? The voltage on a chip's output pin is measured as 5V with no load connected to it. With a 20Ω resistor attached, the output voltage is 4V. What is the value of the internal resistance of the output? **Show all your work** below.

15. [1 mark] Consider the internal wiring of a 7-segment display. Is it possible to directly control each of the segments individually using less than 7 output pins? If so, how?

16. [1 mark] **Clearly** describe what is meant by the term "switch bounce".

17. [1 mark] **Clearly** describe the difference between the terms "flash" and EEPROM memory.

18. [3 marks] List and **clearly** describe three different methods that could be used to remotely control (ie. interface to) an Arduino based rover robot. Include in your description of each method any sensor(s) required and whether the sensor(s) operates in an analog or digital mode.

Repeat of Circuit for Q1

Name: _____

