

Name: .....

Group  
Members: .....

Coder or  
Builder .....

## Fort Street High School Robotics Examination

Week 8, Term 4 2016

### Examination Details

Exam duration: 1 hour  
Total number of questions: 4  
Total number of marks: 40  
Topics covered: C, RobotC OR C, RobotC, Construction

### Instructions

Your marks as a group for this paper may affect your continuation of Robotics.

**If you are a coder, attempt Questions 1 to 4.**

**If you are a builder, attempt Questions 1 to 3, and Question 5.**

This paper has 11 pages, including the front page.

This paper MUST NOT be retained by the student.

Textbooks, notes, phones, laptops, tablets, smartwatches are not permitted.

All questions may be attempted. You may leave early if you complete your exam.

Examiner's Use Only					
	1	2	3	4 A / B	Total

## Question 1

10 marks

a) Consider the following C program.

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```
#include <stdio.h>

int main() {
    int x, y;
    x = 2;
    y = 5;

    while (x < 40) {
        x = x + 2 * y;
        printf("%i\n", x);
    }

    return 0;
}
```

The program is valid C. It executes without error.

Indicate **exactly** what output is printed.

b) Consider the following C program.

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```
#include <stdio.h>

int main() {
    int x = 3;

    x = x * 3;
    printf("A: %i \n", x);

    while (x > 0) {
        printf("%i\n", x);
        x = x / 2;
    }

    return 0;
}
```

The program is valid C. It executes without error.

Indicate **exactly** what output is printed.

## Question 2

10 Marks

Write a program mark.c that asks for a number, **accepts an integer as input**. It should print out "**PASS**" if the integer is between 50 and 100 inclusive, and "**FAIL**" if the integer is between 0 and 49 inclusive. It should print "ERROR" if the number is less than 0 or more than 100.

The program should be in the **SAME FORMATTING** as the sample outputs below.

```
> mark
Please enter your mark: 42
FAIL
```

```
> mark
Please enter your mark: 50
PASS
```

```
> mark
Please enter your mark: 205
ERROR
```

### Question 3

12 Marks

Consider the following RobotC program.

```
#pragma config(Sensor, S1,      sLeft,      sensorLightActive)
#pragma config(Sensor, S2,      sRight,     sensorLightActive)

#pragma config(Motor,  motorA, mLeft,  tmotorNXT, PIDControl, encoder)
#pragma config(Motor,  motorB, mRight,  tmotorNXT, PIDControl,
encoder)

task main() {
    while (1) {
        int sensorLeft = SensorValue [sLeft];
        int sensorRight = SensorValue [sRight];

        if (50 < sensorLeft < 100 && 50 < sensorRight < 100) {
            motor[mLeft] = 80;
            motor[mRight] = 80;
        }
        else if (sensorLeft < 50) {
            motor[mLeft] = 0;
        }
    }
}
```

The program below is NOT VALID and does not compile. **CLEARLY CIRCLE** the error above.

a) What are the changes you need to make to the line to fix this error?

Questions continue on the next page.

b) What happens to both motors if both the left and right sensors are on white (value approximately 60)?

c) What happens to both motors if both left and right sensors are on white, and then the left sensor detects a reflected light value of exactly 50? Why?

d) What is the purpose of the while loop?

## Question 4

8 Marks

**COMPLETE THIS QUESTION IF YOU ARE A CODER.**

- a) Write a FUNCTION **void printNiceNumber(int num)** that accepts 4  
an integer between 0 and 9999, and prints a formatted number with leading zeroes.

For example, `printNiceNumber(3)` will print out "0003", `printNiceNumber(100)` will print "0100" and `printNiceNumber(9995)` will print "9995".

b) Write the MAIN FUNCTION **int main()** which prints all numbers from 0 to 9999 formatted with trailing zeros. Assume the function define above in part a) is already declared before the main function is run.

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The output should start like this:

```
0000
0001
0002
0003
```

and so on.

**CODERS STOP HERE.**



## Question 5

8 Marks

**COMPLETE THIS QUESTION IF YOU ARE A BUILDER.**

a) Design and describe a possible model for a can pick-up mechanism. The mechanism must be able to pick up, lift and lower an upright, 375ml aluminium can wrapped in aluminium foil. It has a maximum weight of 100 grams and is filled with rice.

The mechanism can be built with any material, such as steel, Lego components or fabric. It must be able to lift the can 10 centimetres off the ground. It can be powered by a single Lego Mindstorms motor.

You can provide sketches of your model.

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b) Outline possible limitations that can occur with the mechanism you have designed. 2



Extra Writing Space