**Mid-term – Part 2 Hands-on Section (Open Book) – 90 minutes time limit**

**Student Name** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Final Score** out of 50: \_\_\_\_\_\_\_\_

**Instructions:**  There are 5 questions. Construct an NXT-based circuit and write the NXC program that demonstrates the following

1. Create an angle sensor using a potentiometer. Attach the pot to the NXT’s Port 1. The NXT brick should continuously display the angle of the pot’s shaft. When the shaft is positioned at 12:00; 3:00, 6:00, 9:00 as 0, 90, 180, and -90 degrees respectively. In-between those positions, the brick should display the appropriate angle **(15-points)**
2. Connect an NXT motor to the brick’s Port A. Using the circuit from Q1 above adjust the motor’s speed and direction as follows **(20-points)**

|  |  |  |
| --- | --- | --- |
| Pot Angle | Motor Speed | Motor Direction |
| 12:00 to 3:00 | Increases proportionally from 0 to full-speed | CW |
| 12:00 to 9:00 | Increases proportionally from 0 to full-speed | CCW |

1. Recall that the NXT’s motor ports (Port A, B, and C) can serve as an adjustable voltage source. Connect a reed relay to Port A. Write an NXC program that closes/opens the reed relay’s switch when the user presses the left and right arrows respectively. Connect a toy DC motor to a 9V battery and pass it thru the relay. Thus, when the switch is closed (right arrow), activate the motor. When the switch is open (left arrow), de-activate the motor **(15-points)**