Name ___Theodore Yim___ Start Time __1:40__ End Time _____

ME430 - Mechatronics
Examination II
Summer 2022

Problem	Score
1	/ 12
2	/ 12
3	/ 16
Computer Part	/ 60
Total	/100

For the written portion of the exam, you may use only:
- Two sheets of paper notes. Front and back of two 8.5" by 11" papers (4 sides total), typed or handwritten (any font size is fine). The notes page must be made by you not someone else.
- A pencil/pen.
- A calculator. Maple, Excel, or Chrome (as a calculator only) **may** be used as a calculator, but no other computer usage beyond playing music is allowed.

In addition to those materials, for the computer part of the exam, you may also use:
- Your computer.
- Any paper notes (such as notes on the videos), so long as those notes were written by you or provided as course materials.
- Any electronic notes or code residing on your local (C:) hard drive, so long as those notes/code were written by you or your lab partner.
- The course website and Moodle. These are the only approved websites allowed during the exam.

Anything not specifically allowed is prohibited. In particular, you may not use notes or code written by someone outside your lab group.

Problem 1 – 2 bit mini

Suppose you had a **7 bit** signed integer variable type called int7_t.   What binary bits are stored in memory for the a, b, and c **int7_t** variables and what value would be printed?
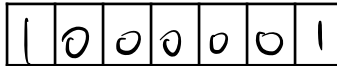
int7_t a = -7;

1	1	1	1	0	0	1

If a was printed, what value would print?

-7

int7_t b = 65;

1	0	0	0	0	0	1

If b was printed, what value would print?

−63

int7_t c = 129;

0	0	0	0	0	0	1
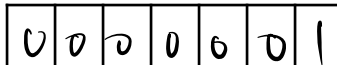
If c was printed, what value would print?

1

What are the min and max sizes for an **int7_t**?

int7_t min value

-64

int7_t max value

63

Problem 2 – Syntax Debugging

Consider the code shown below. This code contains many syntax errors and won't compile. It also has some semantic errors (things that compile, but cause the code not to work when it runs). Circle each mistake or circle the blank area where code is missing, if appropriate. Indicate how each issue should be fixed.

Goal: Continually send the potentiometer 0 reading to the computer at a baudrate of 9600 and if the pusbhutton on pin 2 is pressed, analog write to pin 9 a slowly increasing duty cycle of 0, 50, 100, 150, 200, then 250 for 0.5 second per interval.

```
void setup() {
  pinMode(2, INPUT_PULLUP);
  pinMode(9, OUTPUT);

}  ← missing closing Bracket here

void loop() {
  uint16_t rPot = analogRead(0);
  printPot()  ← missing Argument here   printPot(rPot)
  if (digitalRead(2, LOW)) {   → too many arguments
    for (uint8_t k = 0; k <= 5) {          only (!digitalRead(2))
      delay(500)  missing ";"       needs
      analogWrite(9, k * 50);      another argument here
    }                              (uint8_t k=0; k++; k<=5)
  }
  delay(10);
}

void printPot(uint16_t rPot) {
  Serial.println(rPot);
}
```

Problem 3 – Binary table

Make the conversions necessary to fill in the following table given the declaration of the variable x in the first column. For Binary and Hex show the correct number of digits. For ASCII put your answer in in single quotes (for example `'A'`).

Variable Declaration	Binary	Hex	Dec	ASCII
`int8_t x = 338;`	0b 0101 0010	0x52	82	'R'
`int8_t x = 0xAD - 0b10000000 + 5;` 0b1 010101 50 -83 -128	0b 0011 0010	0x32	50	'2'
`int8_t x = (5 ^ 2) - 7;` 25 14	0b 0000 1110	0x0E	14	
`int16_t x = 0xFFFA - 10;`	0b 1111 0000	0xF0	-16	

9   A   B   C   D   E   F
     10   11   12   13   14   15

Dec	Chr	Dec	Chr	Dec	Chr
32	Space	64	@	96	`
33	!	65	A	97	a
34	"	66	B	98	b
35	#	67	C	99	c
36	$	68	D	100	d
37	%	69	E	101	e
38	&	70	F	102	f
39	'	71	G	103	g
40	(	72	H	104	h
41	)	73	I	105	i
42	*	74	J	106	j
43	+	75	K	107	k
44	,	76	L	108	l
45	-	77	M	109	m
46	.	78	N	110	n
47	/	79	O	111	o
48	0	80	P	112	p
49	1	81	Q	113	q
50	2	82	R	114	r
51	3	83	S	115	s
52	4	84	T	116	t
53	5	85	U	117	u
54	6	86	V	118	v
55	7	87	W	119	w
56	8	88	X	120	x
57	9	89	Y	121	y
58	:	90	Z	122	z
59	;	91	[	123	{
60	<	92	\	124		
61	=	93	]	125	}
62	>	94	^	126	~
63	?	95	_	127	DEL

<u>When done:</u>
When you finish this problem you have finished the paper part of this exam. You can look over your work, but once you decide to start the computer part of the exam, you must turn these pages over and not alter them. It is as if you are **handing them in** before you are allowed to start the computer part (but you'll actually do the "handing in" later since it takes a while to generate the PDF and upload it to Gradescope).