

Final Preparation

Questions?

Final Exam

- When: 8:00-10:00 am Friday, May 8th
- Location: here
- 1/3: midterm material
 - See lecture notes for midterm preparation
- 2/3: material since midterm
- 1 page of personal notes
- No electronic devices/books/other notes

Exam Parameters

- Most questions: multiple choice
 - Can grade your exam as you leave
- Assigned seating

Sources of Material

- Exam discussion on D2L
 - Post sample questions (and answers)
 - Some may appear on the exam
- In-class and Zyante exercises
- Pencasts; linked web pages
- Lecture notes
- Homework assignments and exams from prior years (both midterms and finals)

Pre-Midterm Material

- Number Representations (binary, hex)
 - Two's complement for signed numbers
- Arithmetic: incrementing, decrementing and shifting; computing the negative of a number
- Bit-wise operators
- Analog to digital conversion (and vice versa)
- Digital I/O on the Atmel Mega processors
- Basic circuits: LEDs, analog comparators, resistors
- Motor control: H-bridges; PWM

New Material

- Proportional-derivative control
- Timer/counters
- Interrupts and interrupt service routines
- Finite state machines
- Serial communication and the ASCII representation

Timer/Counters

- Prescalers
- Counters (hardware)
 - Timer 0, 2: 8-bit
 - Timer 1, 3, 4, 5: 16-bit
- Interrupts on timerX overflow
- Computing timerX count frequencies/periods
- Computing timerX interrupt frequencies/periods

Interrupts

- What are they?
- Interrupt service routines. Examples:
 - Pulse Width Modulation (PWM) generation (see slides)
 - Producing digital signals of various frequencies (e.g., can introduce software counters, too)

Finite State Machines

- Definition
 - States
 - Inputs / Events
 - Transition function
 - Outputs / Actions
 - State transition diagrams
- FSMs for control

C Code

- Be prepared to read (and possibly fix) simple C code
- If any, you will not write more than a few lines of code
- Look to lecture discussions of code and your projects as you prepare

Serial Communication

- Synchronous vs asynchronous communication
- Asynchronous:
 - Start bit for clock synchronization
- ASCII representation of characters

Character Representation: ASCII

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Time System

Binary	Dec	Hex	Glyph	Binary	Dec	Hex	Glyph	Binary	Dec	Hex	Glyph
010 0000	32	20	SP	100 0000	64	40	@	110 0000	96	60	`
010 0001	33	21	!	100 0001	65	41	A	110 0001	97	61	a
010 0010	34	22	"	100 0010	66	42	B	110 0010	98	62	b
010 0011	35	23	#	100 0011	67	43	C	110 0011	99	63	c
010 0100	36	24	\$	100 0100	68	44	D	110 0100	100	64	d
010 0101	37	25	%	100 0101	69	45	E	110 0101	101	65	e
010 0110	38	26	&	100 0110	70	46	F	110 0110	102	66	f
010 0111	39	27	'	100 0111	71	47	G	110 0111	103	67	g
010 1000	40	28	(	100 1000	72	48	H	110 1000	104	68	h
010 1001	41	29	)	100 1001	73	49	I	110 1001	105	69	i
010 1010	42	2A	*	100 1010	74	4A	J	110 1010	106	6A	j
010 1011	43	2B	+	100 1011	75	4B	K	110 1011	107	6B	k
010 1100	44	2C	,	100 1100	76	4C	L	110 1100	108	6C	l
010 1101	45	2D	-	100 1101	77	4D	M	110 1101	109	6D	m
010 1110	46	2E	.	100 1110	78	4E	N	110 1110	110	6E	n
010 1111	47	2F	/	100 1111	79	4F	O	110 1111	111	6F	o
011 0000	48	30	0	101 0000	80	50	P	111 0000	112	70	p
011 0001	49	31	1	101 0001	81	51	Q	111 0001	113	71	q
011 0010	50	32	2	101 0010	82	52	R	111 0010	114	72	r
011 0011	51	33	3	101 0011	83	53	S	111 0011	115	73	s
011 0100	52	34	4	101 0100	84	54	T	111 0100	116	74	t
011 0101	53	35	5	101 0101	85	55	U	111 0101	117	75	u
011 0110	54	36	6	101 0110	86	56	V	111 0110	118	76	v
011 0111	55	37	7	101 0111	87	57	W	111 0111	119	77	w
011 1000	56	38	8	101 1000	88	58	X	111 1000	120	78	x
011 1001	57	39	9	101 1001	89	59	Y	111 1001	121	79	y
011 1010	58	3A	:	101 1010	90	5A	Z	111 1010	122	7A	z
011 1011	59	3B	;	101 1011	91	5B	[	111 1011	123	7B	{
011 1100	60	3C	<	101 1100	92	5C	\	111 1100	124	7C	
011 1101	61	3D	=	101 1101	93	5D	]	111 1101	125	7D	}
011 1110	62	3E	>	101 1110	94	5E	^	111 1110	126	7E	~
011 1111	63	3F	?	101 1111	95	5F	_				