

This is a closed book exam. Data sheets are provided. You may use a scientific calculator. For the multiple-choice questions, circle the answer that applies. Each question is worth 4 pts. Questions 22 and 24 are worth 6 pts.

1. What is the bitwise AND of 0x8B and 0x55?

0x11

0x01

0xEB

0xF0

2. What is the bitwise XOR of 0xDE with 0xA9?

0x1F

0x05

0x77

0xC0

3. PORTB = 0x38. What is the value of PORTB for the following operation?

`PORTB &= ~(1 << PORTB5);`

0x18

0xF8

0xB1

0x31

4. What is the value of PORTC for the following operations?

`PORTC = 0x5B;`

`num = 0x04;`

`PORTC = (PORTC & 0xF0) | (num & 0x0F);`

0xCC

0xDF

0x3E

0x54

5. Which Port Register bit do you initialize when using digital Pin 51 on the Arduino development board as the connection to an LED circuit?

PORTA1

PORTC6

PORTB2

PORTB3

6. Which Special Function Register (SFR) selects whether the pin is configured as input or output?

PORTxn

PINxn

DDRxn

7. Which SFR is used for reading in a value from an external pin?

PORTxn

PINxn

DDRxn

8. Which SFR is used for output to the pin (logic 0 or logic 1)?

PORTxn

PINxn

DDRxn

9. If PORTxn is written logic one when the pin is configured as an input pin, the pull-up resistor is activated.

TRUE

FALSE

10. What does the following line of code do?

```
if(PINB & (1 << PINB2))
```

Conditional statement: if Digital pin #51 on Arduino Board is logic high;

Conditional statement: if Digital pin #51 on Arduino Board is logic low;

Conditional statement: if Digital pin #50 on Arduino Board is logic high;

Conditional statement: if Digital pin #50 on Arduino Board is logic high;

11. Which component is used to slow down the I/O clock for timers/counters? _

Output Compare Register

Prescaler

Counting Register

Push Button Switch

12. For a 16 Mhz I/O clock, an 8 bit compare value of 125 and a prescaler of 256 -

What is the timer duration?

64 microseconds

100 milliseconds

2 milliseconds

20 milliseconds

13. A 16 Mhz clock using a prescaler of 1024 has what resolution?

- 1200 milliseconds
- 64 microseconds
- 100 microseconds
- 2 microseconds

14. If we want Timer0 to be a 20 microsecond timer using a prescaler of 8 and an I/O clock of 16 MHz, what value must go in OCR0A?

- 250
- 40
- 20
- 5

15. When using an interrupt service routine (ISR), the program main() is halted until the ISR has completed execution.

- TRUE
- FALSE

16. When WGM0 = 0 , WGM1 = 0 and WGM2 = 0, the maximum counter value is

- OCRA
- Value determined by user
- 0xFF
- 0xA1

17. To use Digital Pin # 51 on the Arduino Board as a pin change interrupt, which Interrupt Vector do you use in your program?

PCINT3_vect

PCINT2_vect

PCINT1_vect

PCINT0_vect

18. You can use a timer interrupt to compare the timer count to a specific value.

TRUE

FALSE

19. What is the maximum time duration assuming a 16 MHz clock, a 16-bit timer, and available pre-scaler values are 1, 8, 64, 256?

4.09 milliseconds

1.04 seconds

4.19 seconds

32.77 milliseconds

20. What would be the ISR macro for the Timer0 overflow event?

TIMER0_COMPB_vect

TIMER0_COMPA_vect

TIMER0_OVF_vect

TIMRO_OVF

21. What value goes in OCR0A to create a 600 μ sec timer when I/O Clock = 16MHz and prescaler = 64?

250

100

150

10

22. Specify the line of code to set the output PORTB7 to Logic one.

23. The Pin Change Interrupt ISR is triggered only when the signal on the associated pin goes from HIGH to LOW.

TRUE

FALSE

24. Write the 3 lines of code to configure Timer0 for CTC Mode.

Table 14-1. Reset and Interrupt Vectors

Vector No.	Program Address ⁽²⁾	Source	Interrupt Definition
1	\$0000 ⁽¹⁾	RESET	External Pin, Power-on Reset, Brown-out Reset, Watchdog Reset, and JTAG AVR Reset
2	\$0002	INT0	External Interrupt Request 0
3	\$0004	INT1	External Interrupt Request 1
4	\$0006	INT2	External Interrupt Request 2
5	\$0008	INT3	External Interrupt Request 3
6	\$000A	INT4	External Interrupt Request 4
7	\$000C	INT5	External Interrupt Request 5
8	\$000E	INT6	External Interrupt Request 6
9	\$0010	INT7	External Interrupt Request 7
10	\$0012	PCINT0	Pin Change Interrupt Request 0
11	\$0014	PCINT1	Pin Change Interrupt Request 1
12	\$0016 ⁽³⁾	PCINT2	Pin Change Interrupt Request 2
13	\$0018	WDT	Watchdog Time-out Interrupt
14	\$001A	TIMER2 COMPA	Timer/Counter2 Compare Match A
15	\$001C	TIMER2 COMPB	Timer/Counter2 Compare Match B
16	\$001E	TIMER2 OVF	Timer/Counter2 Overflow
17	\$0020	TIMER1 CAPT	Timer/Counter1 Capture Event
18	\$0022	TIMER1 COMPA	Timer/Counter1 Compare Match A
19	\$0024	TIMER1 COMPB	Timer/Counter1 Compare Match B
20	\$0026	TIMER1 COMPC	Timer/Counter1 Compare Match C
21	\$0028	TIMER1 OVF	Timer/Counter1 Overflow
22	\$002A	TIMER0 COMPA	Timer/Counter0 Compare Match A
23	\$002C	TIMER0 COMPB	Timer/Counter0 Compare match B
24	\$002E	TIMER0 OVF	Timer/Counter0 Overflow
25	\$0030	SPI, STC	SPI Serial Transfer Complete
26	\$0032	USART0 RX	USART0 Rx Complete
27	\$0034	USART0 UDRE	USART0 Data Register Empty
28	\$0036	USART0 TX	USART0 Tx Complete
29	\$0038	ANALOG COMP	Analog Comparator
30	\$003A	ADC	ADC Conversion Complete

THE UNOFFICIAL ARDUINO MEGA PINOUT DIAGRAM

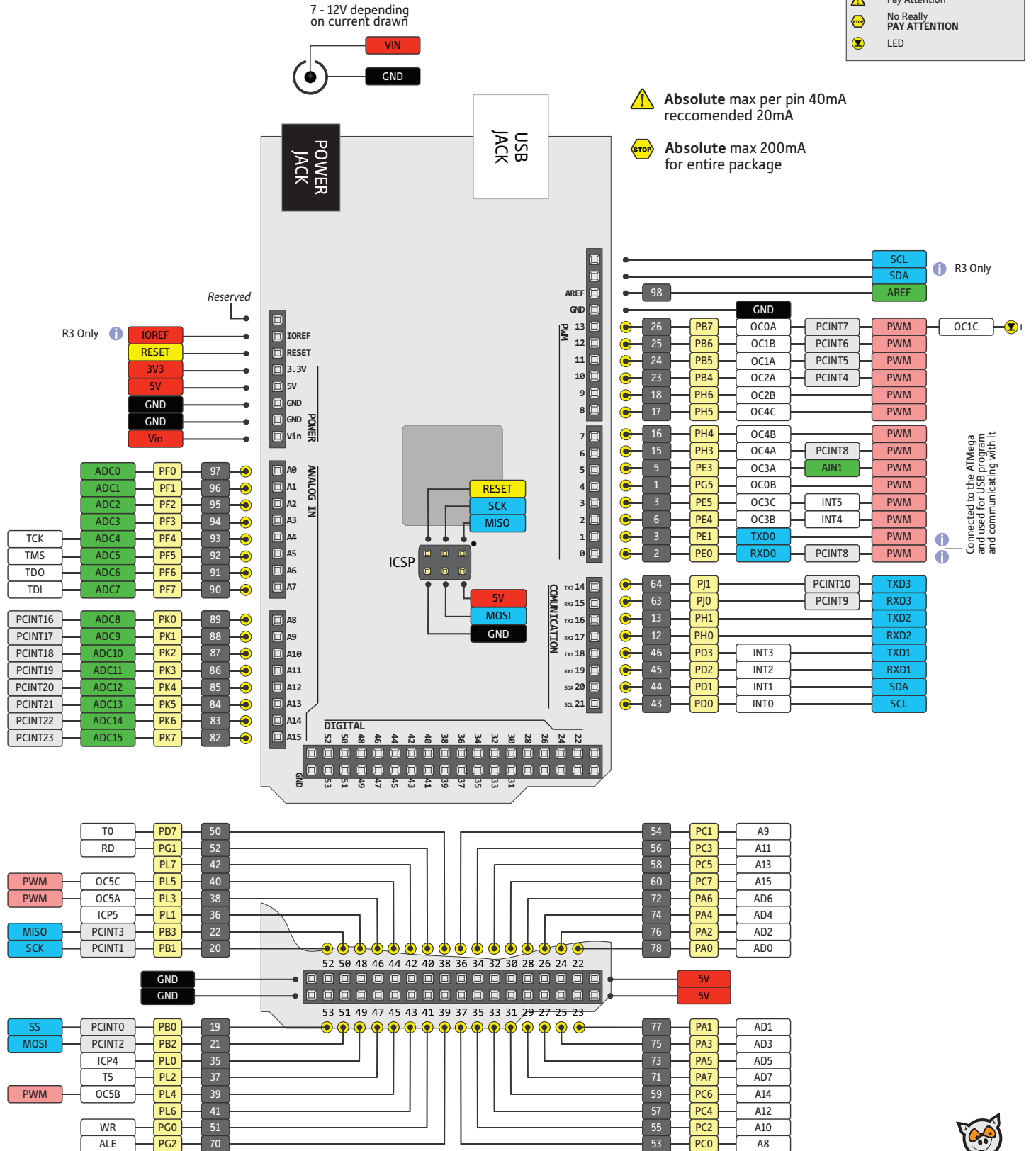
ECE 372A Exam 1a

LEGEND

- GND
- POWER
- CONTROL
- PHYSICAL PIN
- PORT PIN
- ATMEGA PIN FUNC
- DIGITAL PIN
- ANALOG-RELATED PIN
- PWM PIN
- SERIAL PIN

General Information

- Pay Attention
- No Really PAY ATTENTION
- LED



BINARY NUMBER				HEX
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	A
1	0	1	1	B
1	1	0	0	C
1	1	0	1	D
1	1	1	0	E
1	1	1	1	F