Points missed: _____     Student's Name: _____

Total score: _____ /100 points

East Tennessee State University
Department of Computer and Information Sciences
CSCI 2150 – Computer Organization
Final Exam for **Sections 201 & 202** in Spring Semester, 2001

**Instructor:** David Tarnoff

**Read this before starting!**

- The total possible score for this test is 100 points.

- This test is closed book and closed notes

- You may use a calculator

- **All** answers **must** be placed in space provided. Failure to do so will result in no credit for answer.

- **1 point** will be deducted per answer for missing or incorrect units when required. **No** assumptions will be made for hexadecimal versus decimal, so you should always include the base in your answer.

- If you perform work on the back of a page in this test, indicate that you have done so in case the need arises for partial credit to be determined.

"Fine print"

```
INC - Increment
     Usage:  INC     dest
     Modifies flags: AF OF PF SF ZF
     Description:  Adds one to destination unsigned binary operand.


Jxx - Jump Instructions Table
```

| Mnemonic | Meaning | Jump Condition |
|---|---|---|
| JA | Jump if Above | CF=0 and ZF=0 |
| JAE | Jump if Above or Equal | CF=0 |
| JE | Jump if Equal | ZF=1 |
| JG | Jump if Greater (signed) | ZF=0 and SF=OF |
| JGE | Jump if Greater or Equal (signed) | SF=OF |
| JL | Jump if Less (signed) | SF != OF |
| JLE | Jump if Less or Equal (signed) | ZF=1 or SF != OF |
| JMP | Unconditional Jump | unconditional |
| JNA | Jump if Not Above | CF=1 or ZF=1 |
| JNB | Jump if Not Below | CF=0 |
| JNE | Jump if Not Equal | ZF=0 |
| JNG | Jump if Not Greater (signed) | ZF=1 or SF != OF |
| JNL | Jump if Not Less (signed) | SF=OF |
| JZ | Jump if Zero | ZF=1 |

```
MOV - Move Byte or Word
     Usage:  MOV     dest,src
     Modifies flags: None
     Description: Copies byte or word from the source operand to the
     destination operand.  If the destination is SS interrupts are disabled
     except on early buggy 808x CPUs.  Some CPUs disable interrupts if the
     destination is any of the segment registers


POP - Pop Word off Stack
     Usage:  POP     dest
     Modifies flags: None
     Description: Transfers word at the current stack top (SS:SP) to the
     destination then increments SP by two to point to the new stack top.
     CS is not a valid destination.


PUSH - Push Word onto Stack
     Usage:  PUSH    src
     Modifies flags: None
     Description: Decrements SP by the size of the operand (two or four,
     byte values are sign extended) and transfers one word from source to
     the stack top (SS:SP).
```

### *Short Answer (3 points each)*

1.)   What does the segment/pointer register combination CS:IP point to?

2.)   What does the segment/pointer register combination SS:SP point to?

3.)   If DS equals 2500h and DI equals 1234h, what physical address does DS:DI represent?

4.) Assume AX=2354h, BX=AFC3h, and CX=0034h.  After the following code is executed, what would AX, BX, and CX contain?

Place your answers in space below:

```
PUSH AX
PUSH BX                                    AX =
PUSH CX
POP  BX                                    BX =
POP  AX
POP  CX                                    CX =
```

5.) What are the two types of information stored in memory?

6.) If the zero flag is set to zero, what will the processor do if it encounters the instruction **JA   LABEL**?

    a) No matter what, it will jump to address LABEL.
    b) No matter what, it will *not* jump to address LABEL.
    c) It will jump to address LABEL depending on the value of the sign flag.
    d) It will jump to address LABEL depending on the value of the carry flag.
    e) None of the above

7.) True or False: The following two pieces of code have the same end result.

    MOV     AX,[1234h]                MOV     BX,1234h
                                      MOV     AX,[BX]

8.) If AX=FFFFh and the instruction **INC     AX** is executed, what would ZF and SF equal?

9.) List all of the 16-bit general purpose/computation registers of the 8086 processor.

10.) On an 80286 processor, how many address lines are used to access memory using the MOV command?

11.) On an 80x86 processor, how many address lines are used to access memory using the IN command?

12.) On an 80x86 processor, which of the following lines are used to write data to an I/O port?

    a) ^MRDC        b) ^IORC        c) ^MWTC        d) ^IOWC        e) None of these

13.) If an RS232 serial port is set up to have odd parity, what would the parity bit equal if we sent the binary value 10110110?

14.) If it takes 2 x $10^{-3}$ seconds (2 milliseconds) to transmit one bit across a serial interface, what is the baud rate?

### Sort of Short Answer (5 points each)

15.) List two of the three benefits of programming in assembly language that we discussed in class.

16.) If a processor takes 3 cycles to execute any instruction (fetch, decode, execute), how many cycles would a pipelined processor save over a non-pipelined processor to execute 10 instructions?

17.) List an advantage we discussed in class of interrupt-driven I/O.

18.) List two of the three uses we discussed in class of the stack.

19.) If the baud rate is 28,800 bits per second across a link with 1 stop bit, odd parity, and 8 data bits, how many data bits per second are being transmitted?

20.) What is the purpose of having a logic '1' = -12 volts and a logic '0' = +12 volts on an RS232 link?

21.)  Assume the code in the table below is *executed in order on the 80x86, each instruction depending on the result of the previous one*.  For each instruction, identify which registers and flags are affected and enter the new value if you know what it is.  (Just put an 'X' in the box if it's impossible to know the new value.)  Use the memory contents shown in the chart below if necessary. (10 points)

Memory:    DS:0123h = 34h    DS:0124h = 12h    DS:0125h = ACh    DS:0126h = 3Fh

| Instruction | AX | BX | IP | Sign flag | Zero flag |
|---|---|---|---|---|---|
| mov bx,0125h | | | | | |
| mov ah,[bx] | | | | | |
| mov al,[bx+1] | | | | | |
| dec al | | | | | |
| jnz 0987h | | | | | |

*Questions 22, 23, and 24 are based on the following RS232 signal sent with 8 data bits and odd parity.*
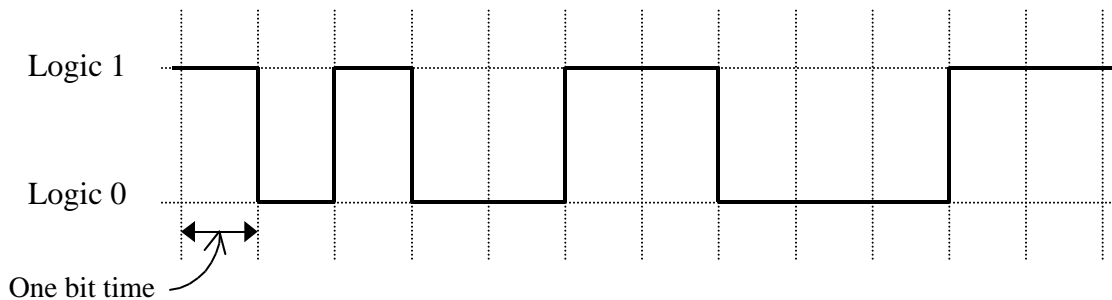


22.)  What is the binary value being transmitted in this signal?  (5 points)

23.)  Is the parity bit correct? (3 points)

24.)  Would the answer to question 25 change if the RS232 signal was set for 7 data bits? (2 points)

25.)  Classify each of the following characteristics as RS232 serial (R), USB (U), GPIB (G), or SCSI (S).  (2 points each)

_____    Serial point-to-point communications
_____    One of its up to 8 devices must be the controller
_____    Can have at most 15 active devices on a single connection
_____    Contains power supply lines in a four conductor connection