

UNC Charlotte–ECGR3/5/6090-Midterm Exam –Multiple Choice–10/15/03

You are permitted 80 minutes to take this test, no more. This is an open book/open notes test. You are allowed the following items for the test: calculators, books, notes, homework, labs, pencils and erasers. You are not permitted to have any of the following on your desk during the test: computer, or other electronic assistance. Failure to abide by this policy will result in a zero for the test and a visit to the UNC Charlotte honor code board.

Multiple Choice - Questions 1-20: Each of these multiple choice questions is worth 4 points for a correct answer, 0 points for an incorrect answer. Enter the your answer on the “optical scan sheet.” Multiple circles will be marked as incorrect. Use a number 2 pencil. Turn in the multiple choice booklet along with the “optical scan sheet” and the short/long answer sheets.

- 1) According to the ECE 306 programming standards, which of the following should be included in the header of a subroutine?
 - a. Your name
 - b. Assumptions
 - c. Inputs/Outputs
 - d. Interfaces
 - e. All should be included

- 2) Which of the following fully describes the outcome of the code at the right?


```
int i, sum;
sum = 0;
i = 0;

for (i=N; i<100; i++) {
    if ((i % 2))
        sum += i;
}
```

 - a. Add all the numbers from 0 to 100 and put the result in sum.
 - b. Add all the odd numbers from 0 to 100 and put the result in sum.
 - c. Add all the even numbers from 0 to 100 and put the result in sum.
 - d. Add all the odd numbers from N to 100 and put the result in sum.
 - e. Add all the even numbers from N to 100 and put the result in sum.

- 3) If I used the MCU30262 instruction ‘enter #4’ at the beginning of a function, how many bytes does the corresponding ‘exitd’ instruction deallocate from the stack if no other enter, exitd, jsr, pop or push operations are performed within the function?
 - a. 6
 - b. 7
 - c. 8
 - d. 9
 - e. 10

- 4) Which of the following is a legal MCU30262 instruction accessing address 0x04FA in memory if A0 contains 0x0500, FB contains 0x0501 and SB contains 0x0502?
 - a. MOV.B R1L, -6[A0]
 - b. MOV.B R0L, -8[SB]
 - c. MOV.B R3H, -7[FB]
 - d. All of the above
 - e. None of the above

- 5) Which of the following is not a part of the compiler?
 - a. Linker
 - b. Compiler (code generator)
 - c. Parser
 - d. Pre-processor
 - e. Garbage collector

- 6) Which of the following registers allow negative displacements when accessing memory?
 - a. SP only
 - b. SP and FB
 - c. FB only
 - d. A0 and A1
 - e. all registers

- 7) Which of the following I/O functionality do your SKP-30262 board and Rom Monitor **NOT** have?
 - a. USB
 - b. Serial
 - c. ADC (Analog to Digital Converter)
 - d. Ethernet
 - e. LCD

- 8) Which of the following assembly instructions is a valid return from a subroutine (ISR or regular)?
 - a. REIT;
 - b. RTS;
 - c. exitd;
 - d. exitd;REIT;
 - e. All of the above

- 17) What is the number of address bits required to address any byte in a memory that contains 4096 bytes?
 a. 2 b. 8 c. 12 d. 16 e. 32

- 18) Assume the assembly language code to the right, and that the variable x is stored in -6[FB] and variable y is stored in -4[FB]. This code is the most likely implementation of which of the following structures?

```

mov.w -6[FB], R0
cmp.w # 0001H, R0
jeq L8
cmp.w # 001fH, R0
jeq L9
jmp L10
L8:
add.w # 0003H, -4[FB]
jmp L7
L9:
sub.w # 0011H, -4[FB]
jmp L7
L10:
sub.w # 0001H, -4[FB]
L7:
    
```

- a. for
 b. while
 c. switch
 d. if...else
 e. None of the above

- 19) Your code is required to perform the function $(M \% 16) * 3$. What should you do to eliminate multiplication and division, assuming M is 32 bits wide?
 a. shift M right by 16, then shift left by 3
 b. shift M right by 4, shift left by 1, and add current value to itself.
 c. shift M right by 4, save the result to register, and add the saved result to current result twice.
 d. AND M with 000000Fh, save the result to register, and add the saved result to current result twice.
 e. AND M with 000000Fh, save the result, shift result left by 2, and add the saved result to current result.

- 20) A 700mAh battery powers a device for 3.5 hours before it stops completely. What is the average current that the device draws?
 a. 200mA b. 200mA c. 2mA d. 2000mA e. 200A

Matching:

Match the tool or device with its function. For the listed number, enter the correct corresponding letter on your optical scanning answer sheet. (2 points each)

- 21) ROM Monitor a. Used to design schematics and PCB board layouts.
 22) ORCAD b. Compiler for C and Assembly Language source code
 23) KNC30 c. Allows you access to memory, registers, and other data on a Renesas embedded board.
 24) TM d. Useful for debugging - you can use these while running a program on an embedded device.
 25) LED e. A development environment for the Renesas embedded board.

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Name: _____ User ID _____

Question	Multiple Choice 1-20	Match 21-25	Short Answer 26-29	Long Answer 30	Total
Score	/80	/10	/70	/40	/200

You are permitted 75 minutes to take this test, no more. This is an open book/open notes test. You are allowed the following items for the test: calculators, books, notes, homework, labs, pencils and erasers. You are not permitted to have any of the following on your desk during the test: computer, cell phone, or other electronic assistance. Failure to abide by this policy will result in a zero for the test and a visit to the UNC Charlotte honor board. Put your answers on this paper. Use only this paper. Turn in this paper and the “optical scan sheet” at the end of the test.

Please read and sign this statement: I have not received from anyone nor assisted others while taking this test. I have also notified the test proctor of any of these violations noted above.

Signature: _____

Short Answer

26) (5 points) Explain what a “dynamic link” is and how it’s used.

27) (20 points) Consider setting the speed of a serial port. The main clock frequency is 20MHz with f1, f8 (1/8 clock) and f32 (1/32 clock) available. It is desired to transmit at 1200 baud. Fill in the values in the table for the actual bit rate and the percent error for the different clocks.

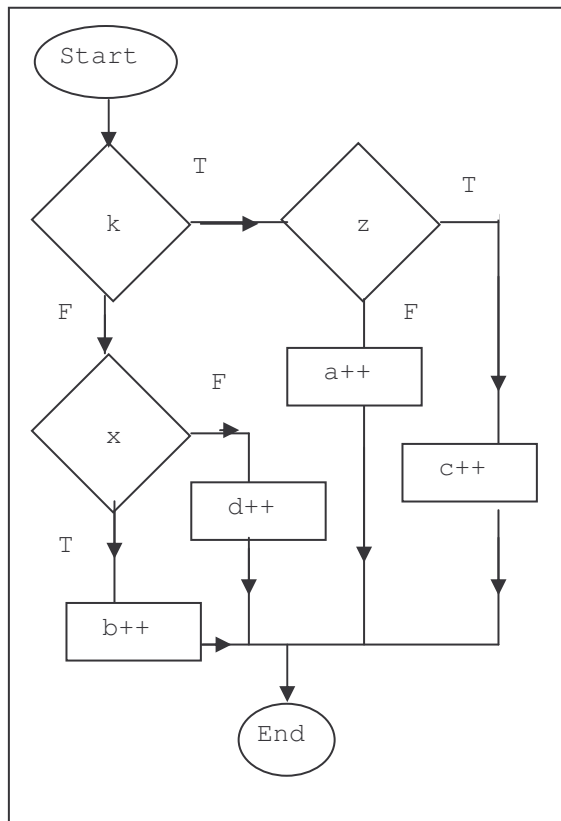
Clock	Actual Bit Rate	Percent Error	u0brg value
f1			
f8			
f32			

Selecting the setting for the lowest percent error in the table above, what would be the valid value for u0brg when writing the c-code? u0brg = _____;

28) (25 points) We have an integer array called x. All the numbers from 1 to 100 appear exactly once in x but the numbers are not sorted (e.g. the order can be x[100]={2; 10; 3; 8; 9; 4; 97; 94;37; 99}). Due to alpha particles destroying a particular entry in x, a number is missing and is read as 0 when accessed. Use less than 10 lines of C code (one statement per line) to find the missing number (not the index) and put it in an integer variable called missing. Don't forget to include proper documentation suggested in coding guidelines (comments, header etc.).

(Hint: consider the current $\sum_{i=0}^{99} x[i]$ and what the uncorrupted value of $\sum_{i=0}^{99} x[i]$ would be).

29) (20 points) Write the C code for this flow chart. Don't forget comments/header etc.



Long Problem

30) (40 points) Examine the code to the right. Show the contents of the stack right BEFORE the line commented with “//THIS POINT” is executed for the given C code. Where you can show values on the stack, put them in the memory space.

- Where specific values are not known, but something has been put on the stack, describe the contents in enough detail to convey your knowledge.
- Where specific information has not been put on the stack, write “XX”. This means that the space beyond the top of the stack should have XX, but there are other areas on the stack which are empty. As a hint, two spots of memory have already been answered.
- Assume both FB and SP point to the bottom of the stack before execution starts.
- Assume that the values of L1 and L2 are 0x0F0400 and 0x0F0300 respectively.
- Describe your assumptions on how much stack space each function requires and where each variable is allocated in the activation record (i.e. offset from FB).

```
int factorial(int n) {
    int temp;
    if (n == 1)
        return 1; //THIS POINT
    else{
        temp = factorial(n-1);
        L1: return n * temp;
    }
}

void main(void) {
    int m, z;
    m = 2;
    z = factorial(m);
    L2: ...
}
```

Address	Value	Description
0x07E1	XX	
0x07E2		
0x07E3		
0x07E4		
0x07E5		
0x07E6		
0x07E7		
0x07E8		
0x07E9		
0x07EA		
0x07EB		
0x07EC		
0x07ED		
0x07EE		
0x07EF		
0x07F0		
0x07F1		
0x07F2		
0x07F3		
0x07F4		
0x07F5		
0x07F6		
0x07F7		
0x07F8		
0x07F9		
0x07FA		
0x07FB		
0x07FC		
0x07FD		
0x07FE	XX	