CS 158/159 Midterm Exam #2
Tuesday November 7, 2017 [8:00pm – 9:30pm]
Loeb Playhouse
Instructor: Alan Bunning

35 Questions * 3 Points Each = 105 Points

Any points earned beyond 100 are considered extra credit.

Exam Rules/Notices:

1. Fill in your name and your student ID# on the answer sheet (write it in AND fill in the bubbles). All student ID numbers must include ten digits beginning with two leading zeros (write it in AND fill in the bubbles). **An incorrect student ID number will result in a zero for this exam.**
2. Do not fill in the section or the test form.
3. **You must be in your assigned seat to receive credit for this exam.**
4. Make sure you have all 35 questions to this exam. You should answer every question. All questions only have one best answer. Please be careful when filling in your answers, any answer determined to be unreadable by Instructional Data Processing will be considered incorrect. Only the answer on your answer sheet can be considered when grading. An operator precedence table is provided on the back of this exam.
5. **NO QUESTIONS WILL BE ANSWERED DURING THE EXAM.** We do not answer questions during the exam due to the limited number of staff members present. It is easier for us to "throw out" a test question with an error than it is to answer questions or to make an announcement during the examination period. **Manage your time accordingly!**
6. You must assume that all C programs and code segments are implemented on the `guru.itap` machine and would be compiled with the `gcc` compiler as set up during the first week of the semester. When segments of code are presented you may assume that the appropriate include statements are present and that the code would be inside of a fully operational function or program.
7. **Protect your work and keep your focus on your own exam.** It is considered dishonest if you copy from another student or to permit another student to copy from you. If a spotter has any reason to suspect questionable behavior, **you may be asked to move to another seat**. Anyone found to violate course policies will receive a failing grade for the course and will be referred to the Office of the Dean of Students.
8. **You are NOT permitted to use any resources during this exam.** This includes but is not limited to; texts, notes, calculators, cell phones, MP3 players, and computers. If your cell phone audibly rings during the exam you will be required to immediately submit your exam and leave the testing facility.
9. When you are finished with the exam, do not raise your hand, but proceed back to the **lobby** to submit your answer form and exit the facility. **You will be required to show photo identification before we can accept your work.** You will keep this exam form. You may not return to your seat once you have submitted your exam.
10. Your score (and exam answers) will appear on Blackboard as soon as possible. Do not contact course staff members about mistakes (if any) until answers are posted.
11. When time is called ALL writing must stop. You are not permitted to continue to make revisions to any answer on your exam once time has been called.
12. **All lecture and lab sections will meet as scheduled for this week.**

NO QUESTIONS WILL BE ANSWERED DURING THE EXAM.

Use the code segment below for problems 1 – 2

```
int x = 11;
int y = 5;
int z = 8;

int result;

result = x-- > 10 && y-- >= 5 || (++z % 2);

printf("x: %d y: %d\n", x, y);
printf("z + result: %d\n", z + result);
```

1. Which of the following is the output generated by the first print statement in the code segment above?
   A) `x: 9 y: 4`
   B) `x: 10 y: 5`
   C) `x: 10 y: 4`
   D) None of the above.

2. Which of the following is the output generated by the second print statement in the code segment above?
   A) `z + result: 10`
   B) `z + result: 9`
   C) `z + result: 8`
   D) None of the above.

3. Which of the following statements regarding the rules of the `switch` construct is FALSE?
   A) The expression that follows the keyword `case` may include a mathematical operator.
   B) The expression that follows the keyword `case` may include one or more constant operands.
   C) The expression that follows the keyword `case` must not represent the same value as any other `case`.
   D) None of the above.

4. Which of the following statements regarding random number generation is TRUE?
   A) The `srand()` function will return a random number.
   B) The `random()` function will return a random number.
   C) The `rand()` function will return a random number.
   D) None of the above.

5. Which of the following data types cannot be used to represent logical data?
   A) `long long`
   B) `double`
   C) `char`
   D) None of the above.

6. Which of the following statements regarding the course standards and the use of control-forcing statements is TRUE?
   A) Each user-defined function must be limited to at most a single `return` statement.
   B) The use of `break` must be limited to repetition constructs.
   C) The use of `continue` must be limited to repetition constructs.
   D) None of the above.

Use the program below for problems 7 – 8

```
#include<stdio.h>

#define CUTOFF1 70
#define CUTOFF2 75
#define CUTOFF3 80

int main()
{
  int x = 75;
  int y = 68;
  int z = 81;
  int result = 0;

  if(y++ / CUTOFF3 || --x / CUTOFF3)
  {
    result = 1;
  }
  else if(x++ / CUTOFF2 || --z / CUTOFF3)
  {
    result += 2;
  }
  else if(--z / CUTOFF3 || ++y / CUTOFF1)
  {
    result += 3;
  }
  else
  {
    result += 4;
  }

  printf("x: %d y: %d\n", x, y);
  printf("z: %d result: %d\n", z, result);

  return(0);
}
```

7. Which of the following is the output generated by the first print statement in the program above?
   A) `x: 74 y: 69`
   B) `x: 75 y: 69`
   C) `x: 76 y: 70`
   D) None of the above.

8. Which of the following is the output generated by the second print statement in the program above?
   A) `z: 80 result: 2`
   B) `z: 79 result: 3`
   C) `z: 81 result: 1`
   D) None of the above.

9. Which of the following statements regarding input validation is FALSE?
   A) Input validation is one example of an event-controlled problem.
   B) Selection alone is not used to implement input validation because it provides only a finite number of opportunities for the user to input acceptable data.
   C) In this course you will be expected to validate that the input given is of the correct data type.
   D) None of the above.

Use the program below for problem 10

```
#include<stdio.h>

int condExpression(int);

int main()
{
  int result;

  result = condExpression(2000);
  result += condExpression(2016);
  result += condExpression(1900);
  result += condExpression(1800);

  printf("result: %d\n", result);

  return(0);
}

int condExpression(int y)
{
  return((!(y % 4) && (y % 100)) ? !(y % 400) : 0);
}
```

10. Which of the following is the output generated by the print statement in the program above?
    A) `result: 0`
    B) `result: 1`
    C) `result: 2`
    D) None of the above.

Use the code segment below for problems 11 – 12

```
int i;
int ct = 0;

for(i = 1029; i >= 5; i /= 2)
{
  ct++;
}

printf("ct: %d\n", ct);
printf("i: %d\n", i);
```

11. Which of the following is the output generated by the first print statement in the code segment above?
    A) `ct: 8`
    B) `ct: 9`
    C) `ct: 10`
    D) None of the above.

12. Which of the following is the output generated by the second print statement in the code segment above?
    A) `i: 1`
    B) `i: 2`
    C) `i: 4`
    D) None of the above.

Use the program below for problems 13 – 14

```
#include<stdio.h>

int calcDays(int);

int main()
{
  int days;

  days = calcDays(5);
  days += calcDays(7);
  days += calcDays(2);

  printf("Result #1: %d\n", days);

  days = calcDays(10);
  days += calcDays(4);
  days += calcDays(0);

  printf("Result #2: %d\n", days);

  return(0);
}

int calcDays(int month)
{
  int days = 28;

  if(month > 6)
  {
    switch(month % 2)
    {
      case 0: days = 31;
      case 1: days = 30;
    }
  }
  else if(month != 2)
  {
    switch(month % 2)
    {
      case 1: days = 30;
      case 0: days = 31;
    }
  }

  return(days);
}
```

13. Which of the following is the output generated by the first print statement in the program above?
    A) `Result #1: 88`
    B) `Result #1: 89`
    C) `Result #1: 90`
    D) None of the above.

14. Which of the following is the output generated by the second print statement in the program above?
    A) `Result #2: 89`
    B) `Result #2: 93`
    C) `Result #2: 92`
    D) None of the above.

Use the program below for problems 15 – 16

```
#include<stdio.h>

int ctDigits(int);

int main()
{
  printf("Result #1: %d\n", ctDigits(1102003));

  printf("Result #2: %d\n", ctDigits(1222344));

  return(0);
}

int ctDigits(int n)
{
  int ct = 0;

  while(n >= 10)
  {
    if(n % 10 == n / 10 % 10)
    {
      ct++;
    }

    n = n / 10;
  }

  return(ct);
}
```

15. Which of the following is the output generated by the first print statement in the program above?
    A) `Result #1: 2`
    B) `Result #1: 3`
    C) `Result #1: 4`
    D) None of the above.

16. Which of the following is the output generated by the second print statement in the program above?
    A) `Result #2: 2`
    B) `Result #2: 3`
    C) `Result #2: 4`
    D) None of the above.

17. Which of the following statements regarding `for` loops is TRUE?
    A) According to the course standards a `for` loop should only be used with counter-controlled processes.
    B) According to the course standards all three expressions are not needed in a `for` loop.
    C) All `while` loops must be converted into `for` loops for counter-controlled processes.
    D) None of the above.

Use the program below for problems 18 – 19

```
#include<stdio.h>

int ctDigits(int);

int main()
{
  printf("Result #1: %d\n", ctDigits(1234566));

  printf("Result #2: %d\n", ctDigits(12223333));

  return(0);
}

int ctDigits(int n)
{
  int ct = 0;
  int prevDigit;

  do
  {
    ct++;

    prevDigit = n % 10;
    n /= 10;
  }while(prevDigit == n % 10);

  return(ct);
}
```

18. Which of the following is the output generated by the first print statement in the program above?
    A) `Result #1: 2`
    B) `Result #1: 3`
    C) `Result #1: 4`
    D) None of the above.

19. Which of the following is the output generated by the second print statement in the program above?
    A) `Result #2: 2`
    B) `Result #2: 3`
    C) `Result #2: 5`
    D) None of the above.

20. Which of the following may result in the dangling else logical error?
    A) Using the assignment operator (=) when the equality operator (==) is expected.
    B) Failing to use { and } with a nested `if/else` construct.
    C) Making use of a `switch` statement inside of an `if` statement.
    D) None of the above.

21. Which of the following statements regarding logical expressions is FALSE?
    A) The order of operations in a logical expression and its complement will be the same.
    B) The number of parentheses in a logical expression will always be the same found in its complement.
    C) A logical expression that contains a NOT operator may also have a NOT operator in its complement.
    D) None of the above.

Use the program below for problems 22 – 23

```
#include<stdio.h>
#include<math.h>

int convertNumber(int, int);

int main()
{
  printf("Result #1: %d\n", convertNumber(1010, 0));

  printf("Result #2: %d\n", convertNumber(110, 4));

  return(0);
}

int convertNumber(int x, int y)
{
  int total = 0;

  if(x > 0)
  {
    total += convertNumber(x / 10, y + 1);
    total += x % 10 * pow(2, y);
  }

  return(total);
}
```

22. Which of the following is the output generated by the first print statement in the program above?
    A) `Result #1: 10`
    B) `Result #1: 20`
    C) `Result #1: 5`
    D) None of the above.

23. Which of the following is the output generated by the second print statement in the program above?
    A) `Result #2: 6`
    B) `Result #2: 48`
    C) `Result #2: 96`
    D) None of the above.

24. Which of the following statements regarding looping constructs if FALSE?
    A) In a `do-while` loop the number of times the loop control expression is evaluated is equal to the number of iterations.
    B) In a `for` loop the number of times the loop control expression is evaluated is one more than the number of iterations.
    C) In a `while` loop the number of times the loop control expression is evaluated is one more than the number of iterations.
    D) None of the above.

Use the code segment below for problems 25 – 26

```
int i;
int j;
int k;
int ct = 0;

for(i = 1; i <= 10; i += 2)
{
  for(j = 1; j < i * 5; j++)
  {
    for(k = 1; k < i + j; k++)
    {
      ct++;
    }
  }
}

printf("i: %d j: %d\n", i, j);
printf("k: %d ct: %d\n", k, ct > 5000);
```

25. Which of the following is the output generated by the first print statement in the code segment above?
    A) `i: 11 j: 50`
    B) `i: 10 j: 45`
    C) `i: 11 j: 45`
    D) None of the above.

26. Which of the following is the output generated by the second print statement in the code segment above?
    A) `k: 56 ct: 0`
    B) `k: 55 ct: 0`
    C) `k: 53 ct: 1`
    D) None of the above.

Use the program below for problems 27 – 28

```
#include<stdio.h>

char convertNumber(int i);

int main()
{
  int x;

  printf("Result: %c\n", convertNumber(x));

  return(0);
}

char convertNumber(int i)
{
  return(i > 9 ? 'A' + (i - 10) : i > 5 ? 'z' - i : '0' + i);
}
```

27. Which of the following initial values of the integer variable `x` will generate `Result: C` as output?
    A) 3
    B) 12
    C) 29
    D) None of the above.

28. Which of the following initial values of the integer variable `x` will generate `Result: r` as output?
    A) 8
    B) 17
    C) 27
    D) None of the above.

Use the program below for problems 29 – 30

```
#include<stdio.h>
#include<math.h>

int main()
{
  int i = 2;
  int j = 1;

  int num = 4;

  while(i++ % 3 != 0 || ++j % 3 != 0)
  {
    while(sqrt(num) - (int)sqrt(num) > 0)
    {
      num++;
    }
    num++;
  }

  printf("i: %d j: %d\n", i, j);

  printf("num: %d\n", num);

  return(0);
}
```

29. Which of the following is the output generated by the first print statement in the code segment above?
    A) `i: 6 j: 3`
    B) `i: 7 j: 3`
    C) `i: 7 j: 4`
    D) None of the above.

30. Which of the following is the output generated by the second print statement in the code segment above?
    A) `num: 25`
    B) `num: 16`
    C) `num: 36`
    D) None of the above.

31. Which of the following statements regarding nested selection and repetition is TRUE?
    A) Nested iterative processes cannot be broken up into different user-defined functions.
    B) Iterative processes are only considered to be nested if both the inner loop and outer loop use the same type of looping statement.
    C) Nested selection often involves the evaluation of two different variables in the control expressions.
    D) None of the above.

32. Which of the following statements regarding the `switch` construct is FALSE?
    A) The `default` case is optional but when it is used it will not be followed by a constant expression.
    B) The expression following the keyword `case` could contain a variable.
    C) The executable statements represented by a `case` may include another `switch` construct.
    D) None of the above.

33. Which of the following statements regarding counter-controlled processes is FALSE?
    A) The loop control variable in a counter-controlled process can only be incremented or decremented by one.
    B) The total number of iterations in a counter-controlled process can be determined prior to the first iteration.
    C) An iterative solution to a counter-controlled process may include either pretest or post-test constructs.
    D) None of the above.

34. Which of the following statements is TRUE regarding redirection of output?
    A) Attempting to redirect output to an existing file will result in an error.
    B) The redirection of output is always accompanied by the use of redirection for input.
    C) When redirecting output, all generated output is sent to the external file.
    D) None of the above.

35. Please read the instructions of this exam thoroughly and then answer which of the following is TRUE?
    A) You are required to fill in the section and test form on the answer sheet.
    B) You should raise your hand to indicate that you are done with the exam.
    C) Questions can be asked during the exam as long as they are only to clarify the nature of the question.
    D) Student ID numbers must include ten digits beginning with two leading zeros and must be completely bubbled in. (This one is the correct answer!)

ASCII Table

Char	Dec	Char	Dec	Char	Dec	Char	Dec
delimiter	0	space	32	@	64	`	96
(soh)	1	!	33	A	65	a	97
(stx)	2	"	34	B	66	b	98
(etx)	3	#	35	C	67	c	99
(eot)	4	$	36	D	68	d	100
(enq)	5	%	37	E	69	e	101
(ack)	6	&	38	F	70	f	102
(bel)	7	'	39	G	71	g	103
(bs)	8	(	40	H	72	h	104
(ht)	9	)	41	I	73	i	105
(nl)	10	*	42	J	74	j	106
(vt)	11	+	43	K	75	k	107
(np)	12	,	44	L	76	l	108
(cr)	13	-	45	M	77	m	109
(so)	14	.	46	N	78	n	110
(si)	15	/	47	O	79	o	111
(dle)	16	0	48	P	80	p	112
(dc1)	17	1	49	Q	81	q	113
(dc2)	18	2	50	R	82	r	114
(dc3)	19	3	51	S	83	s	115
(dc4)	20	4	52	T	84	t	116
(nak)	21	5	53	U	85	u	117
(syn)	22	6	54	V	86	v	118
(etb)	23	7	55	W	87	w	119
(can)	24	8	56	X	88	x	120
(em)	25	9	57	Y	89	y	121
(sub)	26	:	58	Z	90	z	122
(esc)	27	;	59	[	91	{	123
(fs)	28	<	60	\	92	|	124
(gs)	29	=	61	]	93	}	125
(rs)	30	>	62	^	94	~	126
(us)	31	?	63	_	95	(del)	127

This page lists C operators in order of *precedence* (highest to lowest). Their *associativity* indicates in what order operators of equal precedence in an expression are applied.

Operator	Description	Associativity

`()`
`[]`
`++ --`
	Parentheses (function call)
	Brackets (array subscript)
	Postfix increment/decrement
		left-to-right

`++ --`
`+ -`
`!`
`(type)`
`*`
`&`
`sizeof`
	Prefix increment/decrement
	Unary plus/minus
	Logical negation
	Cast (change *type*)
	Dereference
	Address
	Determine size in bytes
		right-to-left

`* / %`	Multiplication/division/modulus	left-to-right
`+ -`	Addition/subtraction	left-to-right
`< <=` `> >=`	Relational less than/less than or equal to Relational greater than/greater than or equal to	left-to-right
`== !=`	Relational is equal to/is not equal to	left-to-right
`&&`	Logical AND	left-to-right
`||`	Logical OR	left-to-right
`?:`	Ternary conditional	right-to-left

`=`
`+= -=`
`*= /=`
`%=`
	Assignment
	Addition/subtraction assignment
	Multiplication/division assignment
	Modulus assignment
		right-to-left

`,`	Comma (separate expressions)	left-to-right

Answers

1. C 2. B 3. D 4. C 5. D
6. A 7. B 8. A 9. C 10. A
11. A 12. C 13. B 14. C 15. A
16. B 17. A 18. A 19. D 20. B
21. B 22. A 23. C 24. D 25. C
26. D 27. B 28. A 29. B 30. D
31. C 32. B 33. A 34. C 35. D