CPSC 217 Midterm

Duration: 60 minutes

7 March 2011

- This exam has 81 questions and 13 pages.
- This exam is closed book. No notes, books, calculators or electronic devices, or other assistance may be used.
- Mark your answers on the supplied answer sheet.
- If you think there are multiple correct answers to a question, select the best answer.

Part I

1. An algorithm is

   (A) a set of instructions in a computer language
   (B) a series of steps followed to solve a problem
   (C) a file whose name ends with `.py`
   (D) something that implements the IPO model

2. A program is

   (A) a set of instructions in a computer language
   (B) a series of steps followed to solve a problem
   (C) a file whose name ends with `.py`
   (D) something that implements the IPO model

3. TRUE/FALSE: There are many different algorithms to solve a given problem.

4. TRUE/FALSE: Algorithms specify a lot of implementation details.

5. TRUE/FALSE: There are many ways to implement an algorithm in a given programming language.

6. Executing a program means

   (A) to run a program
   (B) to write a program
   (C) to stop a program from running
   (D) to kill a process belonging to a program

7. The following are all whitespace characters:

   (A) space, tab, and #
   (B) backslash, space, and tab
   (C) space only
   (D) space and tab

8. Constructing a list of a million integers from zero to 999,999 takes 45 seconds on a small laptop. The program probably built it using

   (A) tuples

   (B) list addition

   (C) the `append` list method

9. What will the following code print?

```
x = (97,)
print type(x)
```

   (A) `<type 'int'>`

   (B) `<type 'float'>`

   (C) `<type 'tuple'>`

   (D) `<type 'list'>`

   (E) There is an error in this code

10. TRUE/FALSE: `'foo'` and `"foo"` represent different strings.

11. `len('')` is

    (A) 0

    (B) 1

    (C) 2

    (D) an error

12. `len('foo foo")` is

    (A) 3

    (B) 6

    (C) 7

    (D) an error

13. `'42' + 3` is

    (A) `45`

    (B) `'45'`

    (C) `'424242'`

    (D) an error

14. `'42' * 3` is

    (A) `126`

    (B) `'126'`

    (C) `'424242'`

    (D) an error

15. TRUE/FALSE: `type('') == type('True')`

16. TRUE/FALSE: Floating point numbers are the same as real numbers.

17. TRUE/FALSE: `6.` has no number after the decimal point, so it is an integer.

18. In the code below, to check if the integer assigned to `foo` is odd, what must `XXX` be?

```
if XXX:
    print 'foo is odd'
```

(A) `foo % 1 == 0`
(B) `foo % 2 == 0`
(C) `foo % 2 == 1`
(D) `foo // 2 == 0`
(E) `foo // 2 == 1`

19. What does the following code print?

```
print 2 + 3 * 5 / 2
```

(A) 9
(B) 10
(C) 11
(D) 12
(E) 13

20. TRUE/FALSE: If `foo` is a positive integer, the expression `foo % N` always gives a result between 0 and N-1, inclusive.

21. TRUE/FALSE: `type(type(42)) != type(type(type(42)))`

22. `'12' + '3'` is

(A) `15`
(B) `'15'`
(C) `123`
(D) `'123'`
(E) `'121212'`

23. After the command below is run, what type does `foo` have?

```
foo = 42 * long(3) + 3.2 - int('32')
```

(A) floating point
(B) integer
(C) long integer
(D) string

24. TRUE/FALSE: Adding one string onto another is called concatenation.

25. Once initialized, a variable may change

(A) its value
(B) its type
(C) its value and type
(D) neither its value nor its type

26. Which of the following are valid variable names?

    (A) `foo` and `2plus3`

    (B) `for` and `foo`

    (C) `_foo` and `__name__`

    (D) `_` and `print`

27. What does the following code print?

```
foo = 1
Foo = 3
Foo = foo
foo = foo + 1
print Foo
```

    (A) 1

    (B) 2

    (C) 3

    (D) 4

28. What shape does the following program draw?

```
import turtle
turtle.left(45)
for i in range(4):
    turtle.forward(90)
    turtle.right(120)
```

    (A) triangle

    (B) rhombus

    (C) diamond

    (D) square

    (E) none of the above

29. What does the following code print?

```
L = [3, 6, 9, 12, 15]
for i in range(len(L)):
    sum = L[i] + L[i-1]
print sum
```

    (A) 27

    (B) 45

    (C) 90

    (D) There is an error

30. Assuming `N` is a positive integer, what value will this code print?

```
x = 0
for i in range(N):
    x = x + 1
print x
```

(A) `N`

(B) `N - 1`

(C) `N + 1`

31. What does the following code print?

```
x = 1
for i in range(4):
    x = x * i
print x
```

(A) 0

(B) 6

(C) 24

(D) 120

32. What does the following code print?

```
i = 0
while i < 100:
    i = i + 1
print i
```

(A) 99

(B) 100

(C) 101

(D) There is an error

33. `range(5)` is

(A) `[0, 1, 2, 3, 4]`

(B) `[0, 1, 2, 3, 4, 5]`

(C) `[1, 2, 3, 4]`

(D) `[1, 2, 3, 4, 5]`

34. `range(1, 5)` is

(A) `[2, 3, 4]`

(B) `[0, 1, 2, 3, 4]`

(C) `[0, 1, 2, 3, 4, 5]`

(D) `[1, 2, 3, 4]`

(E) `[1, 2, 3, 4, 5]`

35. `range(5, 2, -3)` is

    (A) `[]`

    (B) `[5]`

    (C) `[5, 2]`

    (D) `[2, 5]`

    (E) an error

36. How many times is `eek` printed by the following code?

```
for i in range(2):
    for j in range(3):
        if i == j:
            print 'eek'
```

    (A) 0

    (B) 1

    (C) 2

    (D) 3

    (E) 6

37. `bm` is a square 2D black-and-white bitmap image, stored as a list of lists. What does the following code do?

```
for i in range(len(bm)):
    for j in range(len(bm[i])):
        bm[i][j] = 1
```

    (A) Sets all bits to 1

    (B) Sets all bits in the first row to 1

    (C) Sets all bits along the diagonal to 1

    (D) Sets all bits in the first columnn to 1

38. Which is the best conversion of the formula $f = e^{2n} + k$? Assume that `n` and `k` are already defined.

    (A)
```
e = 2.7182818284490451
f = e ** 2 * n + k
```

    (B)
```
e = 2.7182818284490451
f = e ** (2 * n) + k
```

    (C)
```
import math
f = math.e ** 2 * n + k
```

    (D)
```
import math
f = math.e ** (2 * n) + k
```

39. TRUE/FALSE: Computing the first ten values of a function correctly is sufficient to test it.

40. TRUE/FALSE: Programs crash when given incorrect input.

41. TRUE/FALSE: IPO is a program design that stands for input-processing-output.

42. Which implementation of $f = \prod_{i=1}^{k}(i+2)$ is correct? Assume `k` is already defined.

(A)
```
f = 0
for i in range(1, k):
    f = f * (i + 2)
```

(B)
```
f = 1
for i in range(1, k):
    f = f * (i + 2)
```

(C)
```
f = 0
for i in range(1, k+1):
    f = f * (i + 2)
```

(D)
```
f = 1
for i in range(1, k+1):
    f = f * (i + 2)
```

43. Consider the following program, which is called `foo.py`:

```
import sys
print sys.argv
```

The program is run by typing the following. What will the program print?

```
python foo.py bar baz < datafile
```

(A) `['bar', 'baz']`

(B) `['foo.py', 'bar', 'baz']`

(C) `['python', 'foo.py', 'bar', 'baz']`

(D) `['foo.py', 'bar', 'baz', '<', 'datafile']`

(E) `['python', 'foo.py', 'bar', 'baz', '<', 'datafile']`

44. A recursive function is a function

(A) that calls another function

(B) that calls itself

(C) that has multiple return statements

(D) that is nested inside another function

45. What does the following code print?

```
def foo():
    x = 123

x = 42
foo()
print x
```

(A) 42

(B) 123

(C) There is an error

46. What does the following code print?

```
def foo(p, q):
    p = q
    q = 12

p = 34
q = 78
foo(p, q)
print p, q
```

(A) 34 12

(B) 34 78

(C) 78 12

(D) 78 78

(E) There is an error

47. TRUE/FALSE: Bottom-up design decomposes a problem into smaller and smaller pieces.

48. How many lines does the following code print?

```
def A():
    print 'A'
def B():
    A()
    A()
def C():
    A()
C()
```

(A) 0

(B) 1

(C) 2

(D) 4

(E) 5

49. A string is a sequence of zero or more characters. What would you expect this code to do?

```
xs = 'abcde'
for singer in xs:
    print singer
```

(A) Print the letters ‘a’ through ‘e’, inclusive

(B) Print ‘abcde’ five times

(C) Print nothing

(D) Print ‘False’

(E) Give an error

50. TRUE/FALSE: The Monte Carlo method yields an exact result.

51. TRUE/FALSE: Lists and tuples are mutable.

52. TRUE/FALSE: `False != True`

53. TRUE/FALSE: `True and False`

54. TRUE/FALSE: `True or False`

55. TRUE/FALSE: `True and not False`

56. TRUE/FALSE: `'9' > '10' and 9 < 10`

57. TRUE/FALSE: `True != 1 or False != ('' in 'foo')`

58. What does the following code print?

```
i = 0
while i < 5:
    print i,
    i = i + 1
while i < 5:
    print i,
    i = i + 1
```

(A) 0 1 2 3 4

(B) 0 1 2 3 4 5

(C) 0 1 2 3 4 0 1 2 3 4

(D) 0 1 2 3 4 5 0 1 2 3 4 5

(E) 0 1 2 3 4 5 6 7 8 9 10

59. What does the following code print?

```
i = 0
while i < 3:
    break
    i = i + 1
print i
```

(A) 0

(B) 1

(C) 2

(D) 3

(E) 4

60. What does the following code print?

```
for i in range(5):
    if i == 2:
        continue
    print i,
```

(A) 0 1

(B) 0 1 3 4

(C) 0 1 3 4 5

(D) 0 1 2 3 4

(E) 0 1 2 3 4 5

61. The Unix password file has the following format, to quote the manual page: 'There is one entry per line, and each line has the format:

account:password:UID:GID:GECOS:directory:shell'

In the following code, what would `XXX` be replaced with, to print the account and GECOS fields for the first 100 password entries read from the standard input?

```
for i in range(100):
    line = raw_input()
    fields = line.split(':')
    XXX
```

(A) `print fields[0], fields[4]`

(B) `print fields[0], fields[5]`

(C) `print fields[1], fields[4]`

(D) `print fields[1], fields[5]`

62. After the command `T = (1,2,3)` is run, what is `T[-2] * T[2]`?

(A) -4

(B) 3

(C) 4

(D) 6

(E) An error

Part II

Use the following code to answer the questions in this part.

```
L = XXX
for i in L:
    if i == 0:
        x = 0
    elif i == 1:
        x = x + 1
    elif i == 2:
        x = x + 2
    else:
        print x,
```

63. What will the code above print, if `XXX` is changed to

```
[0, 99]
```

(A) 0

(B) 99

(C) Nothing

64. What will the code above print, if `XXX` is changed to

```
[0, 2, 1, 2, -1]
```

(A) 0
(B) 1
(C) 2
(D) 5
(E) Nothing

65. What will the code above print, if `XXX` is changed to

```
[0, 1, 1, 2, 1]
```

(A) 0
(B) 1
(C) 2
(D) 5
(E) Nothing

66. What will the code above print, if `XXX` is changed to

```
[0, 1, 1, 3, 1] + range(4)
```

(A) 2
(B) 3
(C) 2 3
(D) 2 6
(E) Nothing

Part III

Use the following code for the questions in this section.

```
L = [4, 2, 7, 9, 13]
```

67. TRUE/FALSE: `9 not in L`

68. `L[2] + L[1]` is

(A) 6
(B) 9
(C) 16
(D) an error

69. `len(L[1:4])` is

(A) 1
(B) 3
(C) 4
(D) 5

70. `L[-3:]` is

    (A) `[2, 7, 9, 13]`
    (B) `[7, 9, 13]`
    (C) `[9, 13]`
    (D) an error

71. `L[L[2]]` is

    (A) 2
    (B) 4
    (C) 9
    (D) an error

72. `L[L[1]]` is

    (A) 2
    (B) 4
    (C) 7
    (D) an error

Part IV

Use the following code for the questions in this section.

```
D = {5: 3, 13: 2, 3: 7, 8: 12}
```

73. `len(D)` is

    (A) 1
    (B) 4
    (C) 8

74. `D[3]` is

    (A) 5
    (B) 7
    (C) 8
    (D) 12
    (E) an error

75. What would the following code print?

```
s = 0
for x in D:
    s = s + x
print s
```

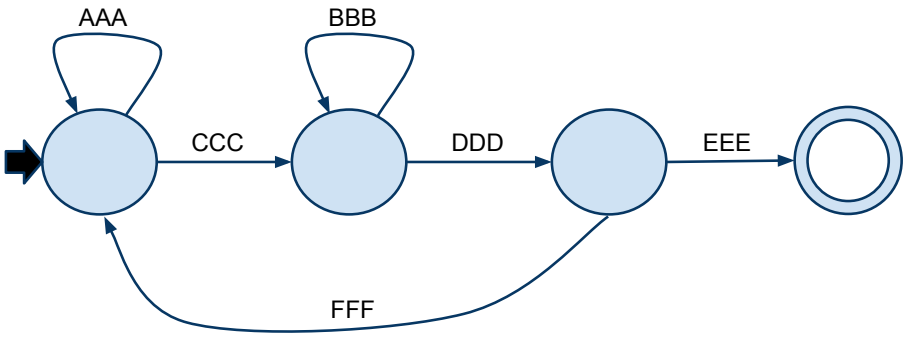
    (A) 24
    (B) 29
    (C) 53
    (D) an error

Part V

A program reads a sequence of input that only contains the strings `foo` and `bar`. For example, one input sequence might be

```
foo bar bar bar foo foo bar foo
```

The following finite state machine should model the logic necessary for this program to determine when it has read `foo bar foo` consecutively and in that order.



76. What label should be given to the edge marked AAA?

    (A) `foo`
    (B) `bar`

77. What label should be given to the edge marked BBB?

    (A) `foo`
    (B) `bar`

78. What label should be given to the edge marked CCC?

    (A) `foo`
    (B) `bar`

79. What label should be given to the edge marked DDD?

    (A) `foo`
    (B) `bar`

80. What label should be given to the edge marked EEE?

    (A) `foo`
    (B) `bar`

81. What label should be given to the edge marked FFF?

    (A) `foo`
    (B) `bar`