There are 35 single choice questions. Each one is worth 4 points. The total score for the exam is 120.

Answer the questions on the bubble sheet given.

Fill in the Instructor, Course, Signature, Test, and Date blanks in the bubble sheet. For “Instructor” put your RECITATION INSTRUCTOR’S LAST NAME given in the table below. For “Course” put CS 177. For “Test/Quiz” put 01.

Fill in the bubbles that correspond to your name, section and Student ID in the bubble sheet. For your section number, use the SECTION NUMBER below:

<table>
<thead>
<tr>
<th>Section number to be used in the scantron card</th>
<th>If you are in recitation:</th>
<th>Rec Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>R04 (THU 3:30) or R08 (THU 11:30)</td>
<td>Gnana Surendra Kumar</td>
</tr>
<tr>
<td>0002</td>
<td>R02 (THU 4:30) or R06 (FR 3:30)</td>
<td>Jin Yu</td>
</tr>
<tr>
<td>0003</td>
<td>R07 (FR 7:30) or R01 (FR 8:30)</td>
<td>Dannie M. Stanley</td>
</tr>
<tr>
<td>0004</td>
<td>R03 (FR 10:30)</td>
<td>Gandikota Venkata</td>
</tr>
<tr>
<td>0005</td>
<td>R09 (FR 11:30) or R05 (FR 12:30)</td>
<td>Ruby Tabhoub</td>
</tr>
</tbody>
</table>

For your student ID, use the 10 digit ID number on your student ID card. **DO NOT USE YOUR SOCIAL SECURITY NUMBER!**

- Exams without names will be graded as zero.
- Only the answers on the bubble sheet will be counted.
- The questions will be discarded.

Remember to fill in also the fields on page 2.
Q1. The big-O notation describes the worst-case complexity of an algorithm. Following is a list of complexities given in the big-O notation. Select the answer which correctly orders the complexity class from less complex to more complex:

A) $O(n^2)$, $O(n \log n)$, $O(n)$, $O(1)$  
B) $O(1)$, $O(n)$, $O(n \log n)$, $O(n^2)$  
C) $O(1)$, $O(n \log n)$, $O(n)$, $O(n^2)$  
D) $O(n \log n)$, $O(1)$, $O(n)$, $O(n^2)$

Q2. What is the complexity of the following function?

```python
def f(mylist):
    for i in range(len(mylist)):
        for j in range(len(mylist)):
            if mylist[i] < mylist[j]:
                k = mylist[j] - mylist[i]
            else:
                k = mylist[i] - mylist[j]
            mylist[i] = k
    return mylist
```

A) $O(n)$  
B) $O(1)$  
C) $O(\log n)$  
D) $O(n^2)$
Q3. What is the complexity of the following function?

```python
def fun(myList):
    i = len(myList)
    while (i > 1):
        x = int(i)
        if myList[x] == 2:
            myList[x] = myList[x] * myList[x]
        i = i/2
```

A) O(log n)
B) O(n)
C) O(1)
D) O(n²)

Q4. What is the complexity of the following function?

```python
def myFunc(myList):
    for n in range(len(myList)):
        if n <= int(len(myList)/2):
            return myList
        else:
            myList[n] = 2*n
    return myList
```

A) O(log n)
B) O(n)
C) O(n³)
D) O(1)
Q5. Consider the following functions that calculate $a^x$. You can assume that both $a$ and $x$ are positive. Also notice that if $x$ is divisible by 2, $a^x = a^{x/2} \times a^{x/2}$.

i)  
```python
def exponent(a, x):
    if x == 1:
        return a
    else:
        if (x%2 == 0):
            return exponent(a, x/2)*exponent(a, x/2)
        else:
            return a*exponent(a, x-1)
```

ii)  
```python
def exponent(a, x):
    if x == 1:
        return a
    else:
        if (x%2 == 0):
            return a*exponent(a, x/2)
        else:
            return a*exponent(a, x-1)
```

iii)  
```python
def exponent(a, x):
    return a*exponent(a, x-1)
```

iv)  
```python
def exponent(a, x):
    if x == 1:
        return a
    else:
        return exponent(a, x/2)*exponent(a, x/2)
```

Which of the function code above is the correct one?

A) ii and iii  
B) i and iv  
C) ii and iv  
D) i
Q6. What is the output of the following code?

def recursive(x):
    if x > 1:
        return recursive(x-1) + recursive(x-2)
    else:
        return 1

print (recursive(5))

A) the code does not terminate due to an incorrect terminating condition
B) 13
C) 8
D) 5

Q7. What is (are) the terminating condition(s) for the following code?

def mystery(x):
    if (x%2 == 1):
        return x
    if (x == 0):
        return x
    if (x%2 == 0):
        return x + mystery(x-2)

A) the code will terminate when x becomes even
B) the code will terminate when x becomes odd
C) the code will terminate when x is odd or when x is equal to 0
D) the code will terminate when x is even or when x is equal to 0
Q8. Consider a large sorted list of \( n \) numbers. Which statement is CORRECT about linear and binary search when searching for a number in such a list:

A) Linear Search runs as fast as Binary Search since the list is already sorted
B) Binary Search should be used because the list is already sorted
C) Binary Search always runs faster than Linear Search when searching for any number in the sorted list
D) Linear Search should be used because the list is already sorted.

Q9. Consider the following search function:

```python
def mySearch(something, aList):
    for item in aList:
        if item == something:
            return "Found it!"
        elif item > something:
            return "Not Found"
```

Which statement is CORRECT about the values returned by the function calls:

\[
\text{mySearch(5, [2, 5, 6, 7, 9, 10]) and mySearch(5, [2, 6, 7, 5, 9, 10]), respectively?}
\]

A) Both returned values are "Found it"
B) \( \text{mySearch(5, [2, 5, 6, 7, 9, 10]) returns "Not Found" while mySearch(5, [2, 6, 7, 5, 9, 10]) returns "Found it"} \)
C) Both returned values are "Not Found"
D) \( \text{mySearch(5, [2, 5, 6, 7, 9, 10]) returns "Found it" while mySearch(5, [2, 6, 7, 5, 9, 10]) returns "Not Found"} \)
Q10. What is the number of swapping operations needed to sort a list of numbers: [8, 22, 7, 9] in ascending order using bubble sort?

A) 3
B) 5
C) 4
D) 16

Q11. Which is the complexity of Bubble Sort and the complexity Merge Sort, respectively?

A) O(n) and O(log n)
B) O(n^2) and O(log n)
C) O(log n) and O(n)
D) O(n^2) and O(n log n)
Q12. You are given the following three functions:

```python
def decimal2hex(num):
    str = hex(num)
    hex_str = str[2:]
    if(len(hex_str)%2==1):
        hex_str = '0'+hex_str
    return hex_str

def tuple2hex(tup):
    red = tup[0]
    green = tup[1]
    blue = tup[2]
    return "#" + decimal2hex(red) + decimal2hex(green) + decimal2hex(blue)

def extractComponents(string):
    result = string.strip("#")
    redC = result[0:2]
    greenC = result[2:4]
    blueC = result[4:6]
    color=makeColor(int(redC, 16),int(greenC, 16),int(blueC,16))
    return color
```

Which of the following statements is true about the code below:

```python
result1 = tuple2hex((0,0,0))
result2 = extractComponents(result1)
```

A) result1 is a hexadecimal encoding of white  
B) result1 is a JES color encoding of white  
C) result2 is a hexadecimal encoding of black  
D) result2 is a JES color encoding of black
Q13. The following function named \texttt{mysum()} takes a list of integers as input parameter. It is supposed to add all the integers in the list and return the sum. However, the programmer has noticed that it produces unexpected results. What kind of bug is present in the code?

```python
def mysum(mylist):
    i = 1
    s = 0
    while i < len(mylist):
        s = s + mylist[i]
        i = i + 1
    return s
```

A) Syntax error  
B) Name error  
C) Logic error  
D) Infinite loop  

Q14. You executed the statement: \texttt{main()}, and received the error message shown below. What does the error message mean?

```python
>> main()
NameError: global name 'x' is not defined
```

A) There is a local variable named $x$ which conflicts with the global variable named $x$  
B) There is a local variable named $x$ but no global variable named $x$  
C) There is no global variable named $x$, but it was used in the function \texttt{main()}  
D) The variable $x$ was not globally defined and not used by the function \texttt{main()}
Q15. Suppose you have the following code:

```python
map(func, range(1, 10))
```

which evaluates to:

```
[False, False, True, True, False, True, False, True, True]
```

Which of the following definitions of `func()` produces the above output? (Hint: take a careful look at the parenthesis)

A) 
```python
def func(x):
    return (not(x%3)) and (not(x%4))
```

B) 
```python
def func(x):
    return (not(x%3)) or (not(x%4))
```

C) 
```python
def func(x):
    return (not(x%3))
```

D) 
```python
def func(x):
    return (not(x%4))
```
Q16. Consider the following functions:

def hello(someone):
    if someone.find("e") == -1:
        print "I do not know you!"
    else:
        print 'Hello ' + someone

def myFunc(function, list):
    for i in list:
        apply(function, [i])

Which is the output produced by: myFunc(hello, ['Alice', 'Mark', 'Robert'])?

A) Robert
B) Hello Alice
Hello Robert
C) I do not know you!
D) Hello Alice
I do not know you!
Hello Robert
Q17. You are given the following Class SmartTurtle:

```python
class SmartTurtle(Turtle):
    def drawSquare(self, astring):
        for i in range (0,4):
            self.turnRight ()
            self.forward ()
        print astring
```

Which of the following statements sequences will execute without a run-time error?

i) >>> earth = World ()
>>> smarty = SmartTurtle(earth)
>>> smarty.drawSquare ()

ii) >>> smarty = SmartTurtle(earth)
>>> smarty.drawSquare ()

iii) >>> earth = World ()
>>> smarty = SmartTurtle(earth)
>>> smarty.drawSquare (smarty, 'DONE')

iv) >>> earth = World ()
>>> smarty = SmartTurtle(earth)
>>> smarty.drawSquare('DONE!')

A) iv)  
B) i) and ii)  
C) i) and iv)  
D) iii)
Q18. For project and lab assignments we used two different Python IDE’s, IDLE and JES. Which of the following Python statements will execute correctly (without a syntax error) in JES but not in IDLE?

A) print 2+2  
B) print(2%2)  
C) i = 2+2  
D) i = 2%2

Q19. Consider the following function:

```python
def func(list):
    if(len(list) < 3):
        return False
    status = True
    for i in range(2, len(list)):
        if (list[i] != list[i-1] + list[i-2]):
            status = False
    return status
```

For which of the following lists does the function return True?

i) [0, 1, 1, 2, 3, 5, 8]  
ii) [1, 2, 3, 5, 7]  
iii) [4, 5, 9, 14]  

A) i) only  
B) iii) only  
C) i) and iii)  
D) ii) only
Q20. What will the following code do?

def function():
    picture = makePicture(pickAFile())
    show(picture)

    x = function()
    print x

A) It will show the picture and print the name of the image file that was chosen
B) It will show the picture and print ‘None’
C) It will print the name of the image file that was chosen
D) It will generate a run-time error

Q21. What is the output of the following code?

def matFun():
    Mat = [[1,2,3], [4,5,6], [2,4,5]]
    x = 0
    for i in range(3):
        x = x + Mat[1][i]
    print x

A) 9
B) 6
C) 15
D) 14
Q22. Given the following function:

```python
def myFunc(x, y, z):
    return [x*z for i in range(y)]
```

What is the output produced by the following code?

```python
M = myFunc(3, 4, 'A')
print(M[0], 'Length1 is = ', len(M), 'Length2 is = ', len(M[0]))
```

A) ['A', 'A', 'A', 'A'] Length1 is = 4 Length2 is = 3
B) ['A', 'A', 'A', 'A'] Length1 is = 3 Length2 is = 4
C) ['A', 'A', 'A', 'A'] Length1 is = 3 Length2 is = 4
D) ['A', 'A', 'A', 'A'] Length1 is = 4 Length2 is = 3

Q23. Consider the following code example and then choose the answer that best describes the purpose of the function:

```python
def my(n):
    x = {}
    for i in range(128):
        x[i] = chr(i)
    return x[n]
```

A) It creates and returns a filled ASCII table dictionary
B) It returns the ASCII number that corresponds to the input parameter
C) It returns the range of characters corresponding to the input parameter
D) It performs the same function as the built in `chr()` function
Q24. Suppose you have the following list definition:

```python
```

Which of the following code snippets will create a dictionary with the following content { 'A': 1, 'D': 4, 'C': 3, 'B': 2 }?

i)
```python
myDic = {}
for i in range(0, len(list), 2):
    myDic[list[i]] = list[i+1]
```

ii)
```python
myDic = {}
for i in range(len(list)-1):
    myDic[list[i]] = list[i+1]
```

iii)
```python
myDic = {}
for i in range(1, len(list), 2):
    myDic[list[i]] = list[i-1]
```

A) i) and ii)
B) iii)
C) i)
D) ii) and iii)
Q25. Given the following function:

```python
import urllib

def func(arg1, arg2):
    connection = urllib.urlopen(arg1)
    content = connection.read()
    file = open(arg2, "wt")
    file.write(content)
    connection.close()
    file.close()
```

If you want to read the content of the web page: http://wiki.cs.purdue.edu/177/exams, and write it in the file exams.html, which are the values that `arg1` and `arg2`, respectively, should have?

A) `arg1='http://wiki.cs.purdue.edu/177/exams' and arg2='exams.html'
B) `arg1='wiki.cs.purdue.edu/177/exams' and arg2='exams.html'
C) `arg1='http://wiki.cs.purdue.edu/177/exams' and arg2='exams'
D) `arg1='http://wiki.cs.purdue.edu/177/' and arg2='exams.html'

Q26. Which of the following statements about the close operation on a file is FALSE?

A) a file previously opened in read mode and then closed can still be read (using `file.readlines()`)
B) if the file was opened in write mode, `file.close()` ensures that all the data are written on the disk
C) if the file was opened in read mode, the main memory used for manipulating the file is released
D) once you close a file, you can no longer read it until you open it again
Q27. Suppose the file `test.txt` contains the following data: A:10:B:20:C:30:D:40:E:50.

What is the output of the following code:

```python
def myFun():
    myFile = open("test.txt", "rt")
    content = myFile.read()
    myList = content.split(':')
    for i in range(1, len(myList), 2):
        print(myList[i])
```

A) A B C D E  
B) A:10:B:20:C:30:D:40:E:50  
C) 10 20 30 40 50  
D) A10B20C30D40E50

Q28. Which is the output of the following function:

```python
def myFunc():
    aString = 'Hello World!'
    aString = aString[6:] + aString[-1] + aString[:5]
    print(aString)
```

A) World!!Hello  
B) IndexError: string index out of range  
C) World!Hell  
D) WorldHello
Q29. You are given the following tree:

\[ \text{tree} = \left[ \left[ "a", "b", \left[ "a", "b" \right] \right], \left[ "a", "b" \right], \left[ \left[ "a", "b" \right], "a" \right] \right] \]

Which of the following indices point to an element having the value “a”?

i) \( \text{tree}[0][0] \)

ii) \( \text{tree}[2][0][0] \)

iii) \( \text{tree}[0][2][1] \)

iv) \( \text{tree}[2][1] \)

A) i) only
B) ii) and iv)
C) i) and iv)
D) i), ii), and iv)

Q30. If you have the following list:

\[ \text{tree} = \left[ \left[ " Leaf 10 ", " Leaf 4 " \right], \left[ " Leaf 3 ", " Leaf 7 " \right], \left[ " Leaf 6 " \right], \left[ " Leaf 2 ", " Leaf 8 ", " Leaf 9 " \right] \right] \]

Which of the following print statements will produce the following output?

Leaf 4 Leaf 8 Leaf 6

A) \( \text{print tree}[1][1] + \text{tree}[3][0] + \text{tree}[2][0] \)
B) \( \text{print tree}[0][1] + \text{tree}[3][1] + \text{tree}[2][0] \)
C) \( \text{print tree}[0][0] + \text{tree}[1][1] + \text{tree}[3][2] \)
D) \( \text{print tree}[0][1] + \text{tree}[3][2] + \text{tree}[2][0] \)
Q31. What is the result of the following code?

```python
def colorPictureFromMatrix(m):
    rows = len(m)
    columns = len(m[0])
    canvas = makeEmptyPicture(columns, rows, black)
    show(canvas)
    for row in range(rows):
        for col in range(columns):
            color = makeColor(m[row][col], 0, 0)
            setColor(getPixel(canvas, col, row), color)
        repaint(canvas)
    return

>>> m = [range(256) for i in range(256)]
>>> colorPictureFromMatrix(m)
```

A) A gray scale gradient from black to gray
B) A red scale gradient from black to red
C) A blue scale gradient from blue to black
D) A green scale gradient from black to green
Q32. You are given the following function:

```python
def loops(j,k):
    sum = 0
    while(k>0):
        for x in range(0,j,2):
            sum += 5
            k = k - sum
    print(sum)
```

What will be the output of the function call `loops(10,6)`:

A) 10  
B) 5  
C) 50  
D) 25

Q33. How many times does the following code print “Final Exam”?

```python
i = 0
while i<5:
    j = 1
    while 0<j<5:
        j = j + 2
        print 'Final exam'
    i = i + 2
    print 'Final exam'
```

A) 9 times  
B) 5 times  
C) 3 times  
D) 2 times
Q34. Consider the following function \( t1 \), where the parameters \( x \), \( y \), and \( z \) can be either 1 or 0. What combination of parameter assignments will print the string “goal”?

```python
def t1(x, y, z):
    if x and y or z:
        x = y
        if x and not z:
            print("goal")
        else:
            x = z
    else:
        z = y
```

A) \( t1(1,1,1) \)
B) \( t1(1,0,0) \)
C) \( t1(1,1,0) \)
D) \( t1(0,1,1) \)

Q35. Consider the following function named \( \text{sel}() \). It takes a list of integers as parameter. What does it print?

```python
def sel(mylist):
    for i in range(len(mylist)):
        if mylist[i] % 2:
            print(i)
```

A) Each element in the list which is odd
B) The index of each element in the list which is even
C) The index of each element in the list which is odd
D) Each element in the list which is even