National University
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Section:	–	**Examination:**	Final
Semester:	Fall 2017	**Total marks:** 40	**Weight:** 40
Time allowed:	180 mins	**Date:**	December, 2017
Course:	CS101 Intro. to Computing	**Instructor:**	Dr. Nauman

Q. No.:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Sign
Scored:																									
Total:	2	2	1	1	2	2	2	2	2	2	2	2	3	2	2	1	1	1	1	2	2	3	1		

- Attempt all questions on the question sheet in the provided space. Text outside the given space (or on another page) will not be read.
- Answer the questions as concisely as possible. Please keep your text within the provided space.
- Think about the question before answering. You have a lot of time to solve the paper but every question would require time to see what the examiner wants. Do not rush.
- **For all questions, assume you can give a solution in either Python or C/C++ unless specifically mentioned.**
- For questions that ask for output of Python code, assume you wrote just the code given in the question in a new Python2.7 notebook cell and no input was given to the interpreter before it.
- Have fun and enjoy the paper!

1. What is an API and why is it a useful concept?

Application Programming Interface — set of functions used to aid abstraction (or delegating tasks to other entities).

Score / 2

2. In Python, what is the rule for variable scope resolution i.e. is the variable searched for in the local frame or the global frame first? Also mention what happens when it is not found in the first frame where it is searched.

Local frame first then global (after that, a NameError)

Score / 2

3. You have the following function for calculating the hyperbolic tangent of an angle starting from a guess *g*.

```
def tanh(angle, g):
    t = 0
    # some calculation here
    return t
```

You want to ensure that the code that calls this function does *not* have to provide a starting guess but still let them pass it if they want. Write a modified function definition that achieves this?

```
def tanh(angle, g=0):
    # same as above.
```

Score / 1

4. What are C/C++ equivalents of Python's *local and global frames*?

Scopes.

Score / 1

5. What would be the output to the console of the following code:

```
def foo(x):
    if x < 10:
        return x
    bar(3)
    print x

def bar(y):
    foo(5)
    print y

bar = foo   <- important line (rest is just dry run)
foo(50)
```

50

Score / 2

6. The following code outputs only one 'y' even though it has two calls to the function `del`. Explain the reason.

```
#include <iostream>
using namespace std;
int del(int x) {
    cout << 'y' << endl;
    return x != 0;
}
```

```
// continued from the left ...

int main() {
    cout << (del(0) && del(1)) << endl;
    return 0;
}
```

Because of short-circuiting. After del(0), && simply returns false.

Score

/ 2

7. Predict the output to the console of the following code snippet:

```
def c():
    d = {'a': [5, 9, 17], 'b': [7, 87, 'g']}
    for i, v in d.items():
        print v[len(v)-1]
print c()
```

Note this.

```
17
'g'
None
```

Score

/ 2

8. Define a function that takes in a number `n` as its parameter. This function should return a *list of tuples* as output. The number of elements in this returned list should be equal to `n`. Each tuple within this list should have 2 elements, which should be exactly `0` and the parameter `n`.

```
def f(n):
    l = []
    for i in range(n):
        l.append((0,n))
    return l
```

Score

/ 2

9. What would the output of the code below?

```
v = [['a-b-c'], ['x-y-z'], ['to-from-since'], ['4-6', '7-2']]
print [i[0] for i in v if len(i) == 1]
```

```
['a-b-c'], ['x-y-z'], ['to-from-since']]
```

Score

/ 2

10. Sentiment analysis is an important concept used by industries worldwide. The idea is to analyze text written by users and decide whether they feel positively about our product or negatively. For example, if a user says, "This phone is boring", we would consider this a negative review. On the other hand, if the user says, "This phone is great", it would be considered a positive review.

    A basic technique for this analysis is to count the number of positive and negative words in a review. In the above two examples, the word 'boring' has a score of -1 since it is negative while the word 'great' has +1 score. Total score of a sentence is calculated by summing over individual word scores.

    For this question, assume we already have a function called `get_word_sentiment_score` that takes in a word as a string parameter and returns the score of that *word*.

    You need to write a function, `get_total_sentiment_score`, that takes in a *list of words* as parameter and calculates the total sentiment score for these words using `get_word_sentiment_score` mentioned above.

```
def get_total_sentiment_score(words):
    score = 0
    for w in words:
        score += get_word_sentiment_score(w)

    return score
```

Score

/ 2

11. (This is a continuation of the previous question.) Write another function, `get_sentence_sentiment_score`, that takes in a sentence in the form of a single *string* as a parameter and calculates the score of the whole sentence using the function defined above.

```
def get_sentence_sentiment_score(sen):
    words = sen.split(' ')
    return get_total_sentiment_score(words)
```

Score

/ 2

12. Define a function that takes in a directory and a file name as parameters and joins them together to create a relative path. Make sure your function works correctly for both Linux and Windows.

```
def f(dir, fn):
    import os
    return os.path.join(dir, fn)
```

Score / 2

13. Study the following code:

```
fname = 'NADRA-data.csv'
with open(fname) as f:
    print f.readline().split('\n')
```

In case the file is not found, this code will throw an `IOError`. Rewrite the code so that in such a case, a friendly error message "File was not found", should be shown instead. However, if *another type* of error comes up, that should still be raised.

```
try:
    fname = 'NADRA-data.csv'
    with open(fname) as f:
        print f.readline().split('\n')
except IOError:
    print 'File was not found'
```

Score / 3

14. Write a function that takes in a string as a parameter and finds out how many vowels (a, e, i, o and u) it has.

```
def vowel_count(s):
    vowels = ['a', 'e', 'i', 'o', 'u']
    count=0
    for c in s:
        if c in vowels: count +=1

    return count
```

Score / 2

15. When is a function prototype needed in C/C++?

when the function is defined after it is called (in source code sequence)

Score / 2

16. In C/C++, what does the name of an array evaluate to?

Starting address

Score / 1

17. Following is an iteration in Python. What would be its equivalent in C/C++?

```
for i in range(2, 20): print i
```

```
for (int i=2; i< 20 ; i++)
    cout << i << endl;
```

Score / 1

18. Why is passing an argument by reference considered bad design?

Because it breaks abstraction (or any variant of this answer)

Score / 1

19. In continuation of the previous question: what would be an alternative (and better) method of allowing a function to modify the calling function's variables?

Pass the address explicitly.

Score / 1

20. Write code to define a structure called `grocery_item`. It should have two pieces of information: item's name and quantity required.

```
Struct grocery_item {
    string name;
    int quantity;
};
```

Score / 2

21. In continuation of above: define another structure `grocery_list`. This structure should be able to store two things: name of the list and a pointer that can hold an address of a `grocery_item` variable.

```
Struct grocery_list {
    string list_name;
    grocery_item *p;
};
```

Score / 2

22. What would be written to the console as a result of running this program?

```
#include <iostream>
using namespace std;

void test(int *p) {
    p++; p++;
    *p = 10;
}

// continued on the right ...
```

```
int main() {
    int a[] = {1, 7, 5, 4, 2, 1};
    test(a);

    for(int i = 0; i < 6; i++)
        cout << a[i] << " ";

    return 0;
}
```

1, 7, 10, 4, 2, 1

important one.

Score / 3

23. *Bonus question:* Write names of two logging *levels*.

Score / 1

— End of Exam —

(Time taken: About 10 minutes.)