

<b>STUDENT NUMBER</b>	
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**NATIONAL UNIVERSITY OF SINGAPORE**

**FINAL ASSESSMENT FOR**

**IT1007 – INTRODUCTION TO PROGRAMMING IN  
PYTHON AND C**

(Semester I: 2017/2018)

**Time Allowed:** 2 Hours

**INSTRUCTIONS TO CANDIDATES:**

1. This is a CLOSED book assessment.
2. This assessment paper contains SEVEN (7) questions and comprises TEN (10) printed pages. Answer all questions.
3. Write your answers in the space provided after each question.
4. Programmable calculators are **not** allowed in this assessment.
5. You are allowed to bring one piece of cheat sheet
6. Please write your student number at the space above but do **NOT** write your name

**TIDINESS COUNTS!**

We will deduct marks if your writing is too messy.

Question Number	Max. Marks	Marks
1	4	
2	4	
3	4	
4	4	
5	4	
6	10	
7	20	
	<b>Total Marks:</b>	

## SECTION A

This section is for Python, please answer the questions according to the Python version that we are using in class, namely, version 3.6.0.

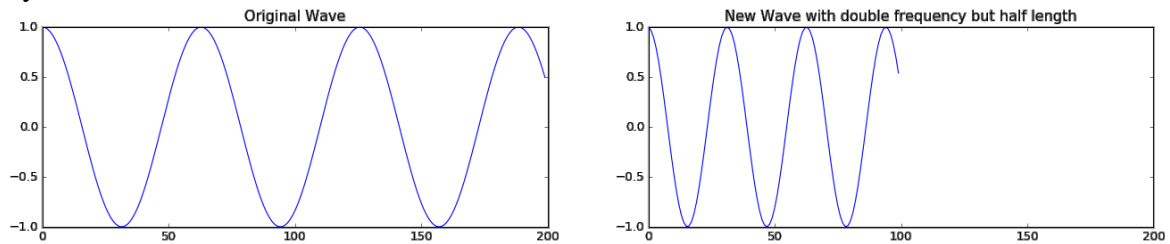
### Question 1 [4 marks]

Evaluate the following terms. If any of these causes an error, please write “error” instead.

<b>Evaluate the Following:</b>	<b>Answer:</b>
<b>2 ** False</b>	
<b>1 + 2 * 3 ** 2</b>	
<b>'abc'[2]</b>	
<b>int(1.6)</b>	
<b>'abcdef'[1::3]</b>	
<b>not ''</b>	
<b>[1,2,3,(4,5,6),7][3][2]</b>	
<b>--1</b>	

### Question 2 [4 marks]: Doubling the frequency of a wave

You are given a wave like your lab exercise before. The wave is stored as a list of numbers. This time, your job is to double the frequency of a wave by shortening its length by half.



Write a function ‘double\_freq(wave)’ to return a new wave with double the frequency and half of the original length, following the details below:

- For every position in the original wave with an even index, we average this sample with the next one to produce the sample in the new wave.
- Let `len(wave)` be  $L$ . You can assume that  $L > 0$  and  $L$  is even.
- Your new wave should be a list with length  $L/2$ .
- As in the lab before, you should **NOT** modify the original wave input
- You should NOT use any packages at all.

```
def double_freq(wave):
```

**Question 3 [4 marks]**

Each row of the table is a separate program/file. What is the output of each of them? If the code produces errors or runs into infinite loops, please state 'error' or 'infinite loop' respectively.

Code	Output
<pre>l = [1,2] a = 1  def double(x):     x += x  double(l) double(a)  print(l) print(a)</pre>	
<pre>b = 128  def half(x):     return x / 2  print(half(half(half(b))))</pre>	
<pre>c = (2,)  def complicate(x):     if x[0]==0 :         return x     else:         return complicate([x[0]-1,x])  print(complicate(c))</pre>	
<pre>d = {} s = 'IT1007' for i in range(len(s)):     d[s[i]] = i print(d)</pre>	

#### Question 4 [4 marks]

Write a function to calculate the mean RGB values for a picture. Your function should return a list with three values as red, green and blue respectively. The first few lines of code are written for you. To gain the full mark:

- You are NOT allowed to use functions from any packages such as the functions 'mean()' and 'average()' in package numpy, other than the line with 'imread' which is written for you.
- And also, cannot use the built-in function 'sum()'. Sorry....

#### Sample output:

```
>>> print(meanRGB('Ji_Chang_Wook.jpg'))  
[ 234.30944011  231.27928453  232.10331584]
```

Answer:

```
from scipy import misc,ndimage  
  
def meanRGB(filename):  
    pic = misc.imread(filename)
```

### Question 5 [4 marks]

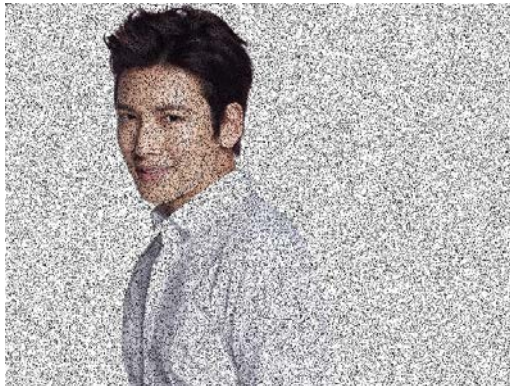
Write a function to add noise into an image. Your function will take in a filename and an integer  $p$  for  $0 \leq p \leq 100$ , such that every pixel of the image will have a chance of  $\%p$  to become totally black. And, of course, you cannot use any already-built 'noise' functions from packages. Here are some example outputs.



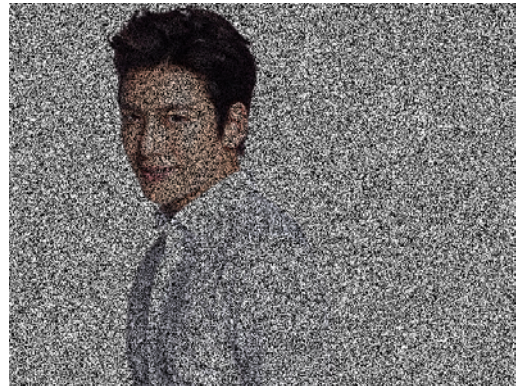
Original Image



$p = 10$



$p = 20$



$p = 50$

**Answer:**

```
from scipy import misc, ndimage
import numpy as np
import random

def add_noise(filename, percent):
    pic = misc.imread(filename)
```