

Examination: Programming I (AE1106Python)**Date: Tuesday April 10th 2012 14.00-17:00 hr****Part I: Reading Python (24 pts)**

1. What is the last number which will be printed by the following program, as a result of the last line in the program?

```
s = 0
for i in range(20):
    if i%2==0:
        print i
    elif i%3==0:
        s = s + 1
print s
```

2. What will be printed by the following program?

```
total=0
for i in range(2):
    for j in range(3):
        for k in range(5):
            total=total+k
print total
```

3. How many times will the while loop be executed? (Or: how many stripes will appear?)

```
def f(n):
    return 22-n

i=1
while i<f(i):
    i=i+1
    print "|",
print
```

4. What will be printed by the following program?

```
import numpy as np

vm = np.arange(1.,15.,0.5)

for i in xrange(28):
    if i/3>8 :
        print vm[i]
```

Part II Debugging Python: multiple choice (24 points)

5. A student wants to plot $y = \sin(x)$ for x -values in the range $[0, 2\pi]$ in steps of 0.01. The program he/she wrote is given below. Which statement is true about this program?

```
from math import *
import numpy as np
import matplotlib.pyplot as plt

xtab = np.arange(0.0, 2.0*pi, 0.01)
ytab = []

for x in xtab:

    y = sin(x)

    ytab.append(y)

plt.plot(x,y)
plt.show()
```

- A) This program works correctly and will show the graph $y = \sin(x)$
- B) This program will give a runtime error because of incompatible length
- C) This program contains an indentation error and will not work
- D) This program mixes lists, arrays and numbers and will return an error
- E) This program will run but will show a plot window with no lines or graph

6. Which statement is true about the following program?

```
b=0

while 10>=b:

    b=b+1

print b
```

- A) This program will print '10'
- B) This program will print '11'
- C) This program will print '0'
- D) This program will print '1'
- D) This program contains a syntax error and will not work
- E) This program contains will yield an infinite loop

7. Which statement is true about the following program?

```
i=8  
  
for j in range(0,i/2,2):  
  
    print j/3
```

- A) This program is correct and will only print a '0'
- B) This program contains a syntax error and will not work
- C) This program will give a runtime error
- D) This program will print '0' twice
- E) This program will print '0' and '1'

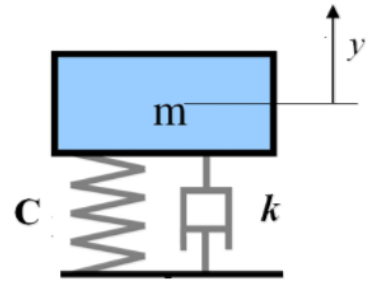
8. Which statement is true about the following program?

```
def hola(a):  
  
    if a%3==0:  
        print "True"  
    else:  
        print "False"  
    return  
  
hola(8)
```

- A) This program will give a runtime error and will not work
- B) This program will not yield any output
- C) This program will print the text "False"
- D) This program contains a syntax error and will not work
- E) This program contains an indentation error and will not work

Part III Supplement Python (20 pts)

9. We want to model a mass-spring-damper system, as illustrated in the figure on the right. The spring has a spring constant c , the damper has a damping constant k . To model the first 25 seconds after the mass has been released from $y=0$ (which corresponds to zero spring force), we write the following program.



```
import matplotlib.pyplot as plt

g = 9.81 # m/s2

m = 20. # kg
c = 10. # N/m
k = 10. # Ns/m

y = 0. # m
vy = 0. # m

t = 0. # s
dt = 0.01 # s

ytab = []
vytab = []
ttab = []

while _____ (a) _____:

    Fspring = -c*y # Spring force
    Fdamp = -k*vy # Damper force
    Fgrav = m*g # Gravity force

    Ftot = _____ (b) _____

    ay = _____ (c) _____
    vy = vy + ay*dt
    y = y + vy*dt

    t = t + dt

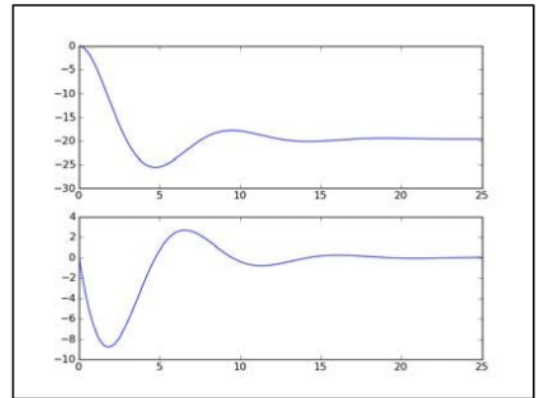
    ytab.append(y)
    vytab.append(vy)
    _____ (d) _____

# End of loop: plotting results

plt._____ (e) _____
plt.plot(ttab,ytab)

plt.subplot(212)
plt.plot(ttab,vytab)

plt.show()
```



Resulting plot

Give what should be entered at the positions marked with (a), (b), (c), (d) and (e) to make this program work in a correct way.