

Mahindra EcoleCentrale
CS 101 : Introduction to Computing
First MidTerm Exam

Date: 09th Feb 2015

Max Marks: 100

Marks: Each question from 1 to 20 carries 2 marks

1. Which of the following results in a Syntax Error?

- a) print "Once upon a time...", she said.' b) print "He said, "Yes! ""
c) print '3\' d) print ""That's okay""

2. What gets printed?

```
x = True
y = False
z = False
```

```
if x or (y and z):
    print "yes"
else:
    print "no"
```

- a) yes b) no c) Syntax Error d) True

3. What gets printed?

```
x = '5'
y = 2
z = x+y
print z
```

- a) 52 b) 7 c) Syntax Error d) z

4. What gets printed?

```
a = 6
b = a/2
printb
```

- a) 3 b) 6 c) 3.0 d) Syntax Error

5. What symbol can you use to comment out one line of code in Python?

- a) * b) (comment) c) // d) #

6. Which one of the following is a valid Python if statement

- a) if a >= 22: b) if (a >= 22) c) if (a => 22) d) if a >= 22

7. If you have a variable example, how do you check to see what type of variable you are working with?

- a) getType(example) b) Type(example) c) type(example) d) example.type

8. Which block of the code will never get executed

```
if a<5:  
    blockA  
elif a>8:  
    blockB  
elif a>20:  
    blockC  
else:  
    blockD
```

- a) blockA b) blockB c) blockC d) blockD

9. How many times the following while loop will execute

```
while 1<2:  
    printi  
    i -= 1
```

- a) 1 b) 2 c) infinite d) 0

10. What is the output of the following program?

```
def example(a):  
    a = a + '2'  
    a = a*2  
    return a  
printexample("hello")
```

- a) hellohello2 b) hello2hello2 c) hellohello d) SyntaxError

11. Select all option(s) that print CS101-is-very-easy

- a) print('CS101', 'is', 'very', 'easy') b) print('CS101', 'is', 'very', 'easy' + '-' * 4)
c) print('CS101-' + 'is - very - easy') d) print('CS101' + '-' + 'is' + '-' + 'very' + '-' + 'easy')

12. What is the output for the following program?

```
a=2  
b=2.0  
if (a=b):  
    print "a and b are equal"  
elif (a>b):  
    print "a is greater than b"  
else:  
    print "a is less than b"
```

- a) a and b are equal b) a is greater than b c) Syntax error d) a is less than b

13. What gets printed

```
print type(1j)
```

- a) <type 'int'> b) <type 'str'> c) <type 'complex'> d) <type 'long'>

14. On a *regular* computer (laptop, desktop, smartphone), what components take care of (1) computing, (2) storing *temporary* data and (3) storing *permanent* data.

- a) CPU (1), hard drive disk (2), RAM (3)
b) RAM (1), CPU (2), hard drive disk (3)
c) hard drive disk (1), RAM (2), CPU (3)
d) CPU (1), RAM (2), hard drive disk (3)

15. The following discoveries are sorted in *historical order* (from the oldest to the more recent), which order is the correct one?

- a) calculator machines, programming languages, the computer mouse, the Internet, Facebook
b) Facebook, the Internet, calculator machines, the computer mouse, programming languages
c) calculator machines, the Internet, programming languages, Facebook, the computer mouse
d) calculator machines, the computer mouse, the Internet, programming languages, Facebook

16. According to many historians, who is often considered as *the first Programmer* of all time:

- a) Richard Stallman b) Bill Gates c) Lady Ada Lovelace d) Steve Jobs

17. In Python, executing that line ``print "Result is:", (2/2)*(2**2)`` will produce the output:

- a) ``"Result is:", 2`` b) ``4`` c) ``Result is: 1`` d) ``Result is: 4``

18. What is Python exactly?

- a) a species of snakes and a family of computer,
b) a programming language, that you have to buy from a company
c) a text editor to write programs, written in the Spyder language
d) a free and open-source programming language

19. What is the output for that piece of code:

```
`print "First is:", 180678 % 5, "and second is:", 2015 < 1000`
```

- a) ``First is: 36135.6 and second is: False`` b) ``First is: -2 and second is: True``
c) ``First is: 36135 and second is: 1015`` d) ``First is: 3 and second is: False``

20. In Python, a ****for**** loop is written as something like:

```
a) ```python
for(inti = 0, i += 1, i < n){
    # block to be executed for the value i (one or more line)
}
# End of the for loop```
```

```
b) ```python
# mylist is a list of values, like [-2, 3, 4, 2015]
fori in mylist:
    # block to be executed for the value i (one or more line)
# End of the for loop```
```

```
c) ```python
# mylist is a list of values, like [-2, 3, 4, 2015]
fori in mylist do:
    # block to be executed for the value i (one or more line)
done;
# End of the for loop```
```

```
d) ```python
# mylist is a list of values, like [-2, 3, 4, 2015]
fori in mylist:
    # block to be executed for the value i (one or more line)
i=i+1
# End of the for loop```
```

21. Write a Python program for evaluating the value of x from the simple linear equation

$$ax + b = 0$$

The value of x has to be evaluated from the values of a and b , which are in turn to be obtained from the user by request.

Thus your program will first ask the user to enter values of a and b , and then use these to compute x from the above formula. At the end, the obtained value of x will be printed.

Marks: 8. Semantics of the program, i.e. does it do what it is supposed to do, will carry more marks than Syntax of the language.

22. Write a Python program for evaluating the 2 roots of a quadratic equation of the form

$$ax^2 + bx + c = 0$$

where a , b and c are to be individually obtained from the user by request. Use your knowledge of mathematical formulae for evaluating the roots of a quadratic equation and write Python code for the same. Importantly, check that the discriminant (quantity under the root sign) is non-negative, and if it fails this check, then an error message saying “Real roots do not exist” is printed and the program ends. When the check is satisfied, the values of the two roots are calculated and then printed.

Marks: 15. Semantics of the program, i.e. does it do what it is supposed to do, will carry more marks than Syntax of the language.

23. A program for evaluating the square root of a number supplied by the user, which you have seen before, is supplied below. Now, at start before calling the function, introduce a check that if the user mistakenly enters a negative number, the program catches an error and says “Please enter only positive numbers” and then ends. *You do not need to write additional lines of code for this. Instead, write a flowchart for the complete program that includes the below lines plus this additional check.*

Marks: 12.

```
# Program Starts
defsq_root_of_a_number(num):
    guess = num/10.0
    guess_sqr = guess**2
    count = 0
    while (abs(guess_sqr - num) >= 1.0e-6):
        guess_sqr = guess**2
        guess = (guess + num/guess)/2
        count += 1
    print count, " guess= ", guess
    print "Before returning: ", guess
    return guess

number = input('Enter a positive number whose square root is to be found \n')
print number
square_root = sq_root_of_a_number(number)
print "After returning: ", square_root
# Program Ends
```

24. A function $x(t)$ (distance x as function of time t) is given as

$$x(t) = 10t + 5t^2$$

Evaluate the derivative of x with respect to t at $t = 5$, both algebraically and numerically. For the algebraic evaluation, use mathematical formulae that you have learnt earlier. For numerical evaluation, use backward, forward and central differences that you have learnt before in your Maths classes. Compare each of the three numerically evaluated values against the algebraic value and decide which among them is most accurate.

The above problem is solved in the program provided below. However, this program has a few errors, in particular, five Syntax and two Semantic errors. You have to spot and list out these errors. Further, you need to write out what the final printed output from the program would be if all the Syntax and Semantic errors were corrected (do not worry about blank spaces and new lines).

Hint: Syntax errors are grammatical mistakes in the language of the program – those for which an interpreter/ compiler will throw errors. Semantic errors represent mismatches between what the program is supposed to do, and what it is actually doing – and an interpreter/ compiler will not detect semantic errors.

Marks: One for spotting each Syntax error, five for each Semantic error, and ten for correctly representing the final print statement from the program. *You need to write down in your answer sheet the locations in the programs where these errors are.*

Program Starts

Variable t represents time

Variable x represents distance

D[0] represents first derivative by backward difference

D[1] represents first derivative by forward difference

D[2] represents first derivative by central difference

xd5 represents algebraically evaluated first derivative of x, at t = 5

IMP - No errors related with indentation are present in program below.

t = 5

xd5 = 70

D = [None] * 3 # this line you are yet to learn, but this line is error-free.

$D(0) = ((10*t + 5*t**2) - (10*(t-1) + 5*(t-1)**2))/1$

Above line corresponds to the backward difference formula

$x_backdiff(t) = (x(t) - x(t-1))/del_t$

$D(1) = ((10*(t+1) + 5*(t+1)**2) - (10*t + 5*t**2))/1$

Above line corresponds to the forward difference formula

$x_forwdiff(t) = (x(t+1) - x(t))/del_t$

$D(2) = ((10*(t+1) + 5*(t+1)**2) - (10*(t-1) + 5*(t-1)**2))/2$

Above line corresponds to the central difference formula

$x_centdiff(t) = (x(t+1) - x(t-1))/(2 \times del_t)$

min_err = None

kmin = 0

for k in range(0, 3):

if(min_err is None):

min_err = D[k]-xd5

if(abs(D[k] - xd5) < min_err):

min_err = (D[k] - xd5)

kmin = k

if (kmin == 0):

 y = "Backward"

elif (kmin == 1)

 y = "Forward"

else

 y = "Central"

print "Minimum error is ", min_err, " attained for kmin = ",kmin, " that is ", y, "- Difference"

#Program Ends