

(Time: 2½ hours)

Total Marks: 75

- N. B.: (1) **All** questions are **compulsory**.
 (2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
 (3) Answers to the **same question** must be **written together**.
 (4) Numbers to the **right** indicate **marks**.
 (5) Draw **neat labeled diagrams** wherever **necessary**.
 (6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt any three of the following:

15

- a. Python programs are executed by an interpreter. There are two ways to use the interpreter. What are they?
- b. When more than one operator appears in an expression, the order of evaluation depends on the rules of precedence. The acronym _____ is an useful way to remember the rules. Explain the same with a Python expression.
- c. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of $1/\pi$:

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)! (1103 + 26390k)}{(k!)^4 396^{4k}}$$

Write a function called **estimate_pi** that uses this formula to compute and return an estimate of π . It should use a while loop to compute terms of the summation until the last term is smaller than **1e-15** (Python notation for 10^{-15}).

- d. Write the output for the following:

- i) `>>> print('a', 'b', 'c', sep = ', ', end='')`
 ii) `>>> 4 * ' '`
 iii) `>>> 'GC' * 0 #This is 'GC' * zero`
 iv) `>>> x = 3`
`>>> 1 < x <= 5`
 v) `>>> 3 < 5 != False`
 vi) `>>> 'abc' < 'abcd'`
 vii) `>>> 'Jan' in '01 Jan 1838'`
 viii) `>>> ' ' in 'abc'`
 ix) `>>> ' ' in ' '`
 x) `>>> len('\')`
`>>> len('it\s')`

- e. A triple of numbers (a,b,c) is called a Pythagorean triple if $a^2 + b^2 = c^2$. In this question, you will be given three numbers. You have to output 1 if the three numbers form a Pythagorean triple. Otherwise, you have to output 0. Note that the inputs may not be given in order: you may have to try all possible orderings of the three numbers to determine whether they form a Pythagorean triple.
- f. Explain **for loop** in Python with an example code to print Fibonacci series up to 10 terms.

[TURN OVER]

2. Attempt **any three** of the following:

- a. i) Name the following code and explain the same:

```
def recurse():
    recurse()
```

- ii) def countdown(n):

```
    if n <= 0:
        print ('Blastoff!')
    else:
        print( n)
        countdown(n-1)
```

What will happen if we call this function as seen below?

```
>>> countdown(3)
```

- iii) Fermat's Last Theorem says that there are no positive integers
- a
- ,
- b
- , and
- c
- such that
- $a^n + b^n = c^n$
- for any values of
- n
- greater than 2.

Write a function named **check_fermat** that takes four parameters— a , b , c and n —and that checks to see if Fermat's theorem holds. If n is greater than 2 and it turns out to be true that $a^n + b^n = c^n$ the program should print, "Holy smokes, Fermat was wrong!" Otherwise the program should print, "Fermat's Theorem holds."

Write a function that prompts the user to input values for a , b , c and n , converts them to integers, and uses **check_fermat** to check whether they violate Fermat's theorem.

- b. Write a Python program to list all the factorial numbers less than or equal to an input number
- n
- .

A number N is called a factorial number if it is the factorial of a positive integer. For example, the first few factorial numbers are

1, 2, 6, 24, 120, ...

Note: We do not list the factorial of 0.

Input: A positive integer, say n .

Output: All factorial numbers less than or equal to n .

Use recursive function to calculate factorial.

- c. i) Write the output for the following if the variable
- fruit = 'banana'**
- :

```
>>> fruit[:3]
```

```
>>> fruit[3:]
```

```
>>> fruit[3:3]
```

```
>>> fruit[:]
```

- ii) What is the reason for the error seen here?

```
>>> greeting = 'Hello, world!'
```

```
>>> greeting[0] = 'J'
```

TypeError: 'str' object does not support item assignment

- iii) Explain any 2 methods under strings in Python with suitable examples.

- d. i) Write a function
- in_both(string1, string2)**
- that does the following:

```
>>> in_both('apples', 'oranges')
```

a

e

s

[TURN OVER]

- ii) Write a function `is_reverse(string1, string2)` to return true if string1 is reverse of string2:
- ```
>>> is_reverse('pots', 'stop')
True
```
- e. Write a Python code to check whether the given number is a strong number. Strong Numbers are numbers whose sum of factorial of digits is equal to the original number (Example:  $145 = 1! + 4! + 5!$ ).
- f. The Ackermann function,  $A(m,n)$ , is defined:

$$A(m, n) = \begin{cases} n + 1 & \text{if } m = 0 \\ A(m - 1, 1) & \text{if } m > 0 \text{ and } n = 0 \\ A(m - 1, A(m, n - 1)) & \text{if } m > 0 \text{ and } n > 0. \end{cases}$$

Write a recursive function named `ackermann` that evaluates Ackermann's function.

3. Attempt any three of the following:

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- a. i) Write the output for the following:

```
1) >>> a = [1, 2, 3]
>>> b = [4, 5, 6]
>>> c = a + b
>>> print c
2) >>> [1, 2, 3] * 3
3) >>> t = ['a', 'b', 'c', 'd', 'e', 'f']
>>> t[1:3] = ['x', 'y']
>>> print t
```

ii) Explain any 2 methods under lists in Python with examples.

iii) Write the function `tail(l)` to get the following output:

```
>>> letters = ['a', 'b', 'c']
>>> rest = tail(letters)
>>> print rest
['b', 'c']
```

- b. i) What is meant by Variable-length argument tuples? Explain with an example.  
ii) Replace the following set of statements with a tuple assignment.

```
>>> temp = a
>>> a = b
>>> b = temp
```

iii) Explain any 3 methods associated with files in Python.

[TURN OVER]

- c. i) What is the significant difference between list and dictionary?  
 ii) Write a Python code to get the following dictionary as output:  
 {1: 1, 3: 9, 5: 25, 7: 49, 9: 81}  
 iii) What is the output of the code given below:  
 >>> squares = {1:1, 2:4, 3:9, 4:16, 5:25}  
 >>> print(squares[5])  
 >>> print(squares[6])
- d. List and explain any five exceptions in Python.
- e. Given a dictionary d and a key k, it is easy to find the corresponding value v = d[k]. This operation is called a lookup.  
 But what if you have v and you want to find k? What is this operation called? Explain the same by writing a Python code.
- f. Explain the following statements:  
 i) >>> a, b = 1, 2, 3  
 ii) >>> addr = 'monty@python.org'  
 >>> uname, domain = addr.split('@')  
 iii) >>> t = divmod(7, 3)  
 >>> print( t)  
 iv) >>> s = 'abc'  
 >>> t = [0, 1, 2]  
 >>> zip(s, t)  
 v) for index, element in enumerate('abc'):  
 print( index, element)

**4. Attempt any three of the following:**

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- a. Explain the role of the Regular Expressions in the following snippets:  
 i) >>> p = re.compile('\d+')  
 >>> p.findall('12 drummers drumming, 11 pipers piping, 10 lords a-leaping')  
 ii) >>> p = re.compile('ca+t')  
 >>> p.findall('ct cat caaat caaaaaat caaat ctttt cccttt')  
 iii) >>> p = re.compile('ca\*t')  
 >>> p.findall('ct cat caaat caaaaaat caaat ctttt cccttt')  
 iv) >>> p = re.compile('a/{1,3}b')  
 >>> p.findall('a/b a//b a///b a////b ab')  
 v) >>> result=re.findall(r'\w\*','AV is largest Analytics community of India')  
 >>> print (result)
- b. Explain Class inheritance in Python with an example.
- c. i) How is method overriding implemented in Python?  
 ii) Which methods of Python are used to determine the type of instance and inheritance?
- d. Name and explain the magic methods of Python that are used in the initialization and deletion of class objects with the help of a code snippet.

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Q. P. Code: 20932

- e. Name the methods in Python Multithreaded Programming. Also mention the module necessary for each of the method.
- A method to spawn another thread
  - A method to return the number of thread objects that are active
  - A method that waits for threads to terminate
  - A method that returns the name of the thread
  - A method that checks whether a thread is still executing.

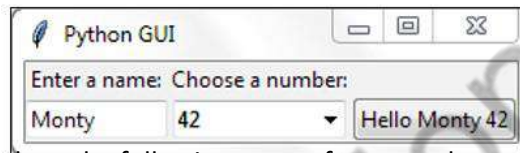
List and explain the methods used under synchronization of threads.

- f. Create a module **armprime** that has two functions, one to check whether the given number is an Armstrong number and the other to check whether the given number is a prime number. Import the above created module in a **.py** file and show the use of the two functions.

5. Attempt **any three** of the following:

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- a. Write a Python code to create the following GUI:



- b. Write a Python code to show the following types of message boxes:



- c. Write a Python code to create the following menu bar :



- d. Explain the Scrolled text widget in Python.

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- e. Write a Python code to do the following:
- Create a table STUDENT with columns Id (integer, not null, primary key), RollNo (integer, not null), Name (not null, varchar), Class (not null, varchar) and Grade (not null, varchar) in MySQL and insert 4 rows of data.
  - Retrieve the rows where Grade = 'O'
- f. Write a Python code to do the following:
- Create a table EMPLOYEE with columns Id (integer, not null, primary key), AdhaarNo (integer, not null), Empname (not null, varchar), Empdept (not null, varchar) and Empage (not null, integer) in MySQL and insert 5 rows of data.
  - Update the respective rows to Empdept = 'ERP' where Empage is  $\geq 40$ .