

### End Term (Odd) Semester Examination December 2025

Roll no.....

Name of the Course and semester: B.Tech. First Semester

Name of the Paper: Introduction to Python Programming

Paper Code: TCS102

Time: 3 hours

Maximum Marks: 100

**Note:**

- (i) All the questions are compulsory.
- (ii) Answer any two sub questions from a, b and c in each main question.
- (iii) Total marks for each question is 20 (twenty).
- (iv) Each sub-question carries 10 marks.

**Q1. CO1**

- a) Explain different types of operating systems.
- b) Discuss the various generations of computers mentioning the key technological changes and their impact on computing performance.
- c) Compare and contrast between system software and application software. Differentiate between compiler and interpreter with example.

**Q2. CO3, CO6, CO2**

(2X10=20 Marks)

- a) Mention any 5 inbuilt functions of lists and strings each with their functionality and a python code.
- b) Describe functions in python with the help of syntax. Explain positional arguments, variable length positional arguments, keyword arguments and variable length keyword arguments with example of each.
- c) Develop a python module named python\_util.py that contains the following functions:
  - i. find\_min\_max() that takes a numpy array as an input and returns minimum and maximum from the array.
  - ii. find\_eigen() that takes a 2-D numpy array as an input and finds the eigen values and eigen vector.
  - iii. find\_upper() that takes string as an input and return the count of spaces and digits.

Create a file demo.py to import the module and call its functions.

**Q3. CO4, CO3**

(2X10=20 Marks)

- a) Discuss indexing, negative indexing, slicing in terms of tuples. Illustrate with the help of code how an element can be added in a tuple. Compare and contrast between dictionary and a set in python.
- b) Mention various file opening modes for writing into a file along with a code snippet. Show how read(), readline() and readlines() functions differ in reading data from a file.
- c) Implement a python program to read a text file input.txt and perform the following with the help of regular expressions:
  - i. Find the count of uppercase letters.
  - ii. Find the words starting with vowels.
  - iii. Check if the string starts with the word Python or not.

The output of each part should be written to a file output.txt.

**Q4. CO5**

(2X10=20 Marks)

- a) Explain and analyze polymorphism in object oriented programming. Compare function overloading and function overriding with the help of an example.
- b) Build a python class named Person with attributes age and name and a function display details. Build another



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classes Student and Teacher that inherits Person class. Student should have roll\_number and marks, Teacher should have subject and salary and a function display details in each class to demonstrate inheritance, encapsulation (private marks or salary), and function overriding by calling a display\_details().

- c) Illustrate different types of inheritance supported by python with the help of a real life example and implement a python code for each.

Q5. CO5, CO6

(2X10=20 Marks)

- a) Elaborate why the cleaning of data is necessary? Mention different ways how a data can be cleaned.
- b) Differentiate and analyze numpy array and a python list in terms of storage, performance, homogenous/non-homogenous. List atleast 3 statistical functions and 3 algebraic functions present in numpy with the help of a syntax.
- c) You are given a 2 dataframes stud\_per\_record that contains stud\_id, name, age, city and stud\_acad\_records that contain stud\_id, sem, cgpa. You are analyzing the records of the students and thus need to perform the following operations:
- i. Merge the two dataframes with inner join.
  - ii. Show the statistical information (mean, count, 1 quantile, 2 quantile, etc.) of the merged dataframe.
  - iii. Find the average cgpa of students grouped by sem.
  - iv. Show a scatter plot between sem and cgpa.
  - v. Filter the records of all the students with age more than 20 or sem less than 3.