Nirma University

Institute of Technology

Computer Science Engineering Department

Open Elective - CSE Department B Tech - 5'th Semester

2CSOE78 : SCIENTIFIC PROGRAMMING

Laboratory details: (List of Experiments, Schedule, assessment policy)

Sr. No.	Week No.#	List of Experiments	Mapped CLO
1	1,2,3	Basic python programming: a. Develop a python program to make a simple calculator using a conditional loop. b. Write a function areaTriangle that takes the lengths of three sides of the triangle as input parameters and returns the area of the triangle as an output. Also, assert that the sum of the length of any two sides is higher than the third side. Write a main function that accepts as command-line arguments and computes the area of a triangle using the function areaTriangle. c. #Write a function that takes two numbers as input parameters and returns True or False depending on whether they are co-primes. Two numbers are said to be co-prime if they do not have any common divisor other than one. d. Write a function that takes a string as a parameter and returns a string with every successive repetitive character replaced with a star(*). For Example, 'balloon' is returned as 'bal*o*n'. e. #Write a function that takes a number as n input parameter and returns the corresponding text in words; for example, on input 452, the function should return 'Four Five Two'. Use a dictionary for mapping to digits to their string representation. f. #Write a recursive function that takes x value as an input parameter and print x-digit strictly in increasing number. [i.e. x = 6 than output 67891011]	1,2
2	4	User inputs: a. The bell shaped Gaussian function, $f(x) = \frac{1}{s * \sqrt{2\pi}} exp\ exp\ [\frac{-1}{2}\ (\frac{x-m}{s})^2]$ is one of the most widely used functions in science and technology. The parameters m and s > 0 are prescribed real numbers. Make a program for evaluating this function for different values of s, x and m. Ask the user to input the values b. #A car driver, driving at velocity v_0, suddenly puts on the brake. What is braking distance d needed to stop the car? One can derive, using Newton's second law of motion or a corresponding energy equation, that $d = \frac{1}{2}\frac{v_0^2}{\mu g}$	1,2

		Make a program for computing d above equation, when the initial car velocity v_0 and the friction coefficient μ are given on the command line. Run the program for two cases: v_0 = 120 and v_0 = 50 km/h, both with μ = 0.3 (μ is dimensionless). (Note: convert the velocity in m/s)	
3	5	File Handling and exception; a. Write a python program that reads the contents of the file poem.txt and count the number of alphabets blank spaces lowercase letters and uppercase letters the number of words starting from vowel and the number of occurrences of each word in the file. b. An organization wants to compute monthly wages to be paid to an employee in an organization. The input data is provided in two different files. File1 contains permanent employee data about employees (i.e. Empid, name, hourly wages), and File2 contains working hours information of each employee in the current month (i.e., empid and hours). Individual elements of data are separated by commas. Design a python program that reads both the files, computes the monthly wages of each employee and store in another file. Take both file names as command line arguments and check the respected exceptions for the same. File Format: **File1** 1001, Vinay kumar, 40 1002, Rohit sen, 35 1003, Vinita sharma, 28 **File2** 1001, 250 1002, 0 1003, 125 c. #Consider the following formula and evaluate the y value for the range of t values found in a file with format $y(t) = v_0 t - 0.5gt^2$ **File Format:** v0 3.0 t: 0.15592 0.28075 0.36807889 0.35 0.57681501876 0.21342619 0.0519085 0.042 0.27 0.50620017 0.528 0.2094294 0.1117 0.53012 0.3729850 0.39325246 0.21385894 0.3464815 0.57982969 0.10262264 0.29584013 0.17383923 More precisely, the first two lines are always present, while the next lines contain an arbitrary number of t values on each line, separated by one or more spaces. i. Write a function that reads the input file and returns v0 and a list with the t values. ii. Write a function that creates a file with two nicely formatted columns containing the t values to the left and the corresponding y values to the right. Let the t values appear in increasing order (note that the input file does not necessarily have the t values sorted). iii. Make a test function that generates an input file, calls the function for reading the file, and checks that the returned data objects are correct.	1,2

<table>
<tr><td></td><td></td><td>iv. Write a function which handle the exception handling for the availability of file or not.</td><td></td></tr>
<tr><td>4</td><td>6,7</td><td>a. Define a class Bank that keeps track of bank customers. The class should contain the following data member:

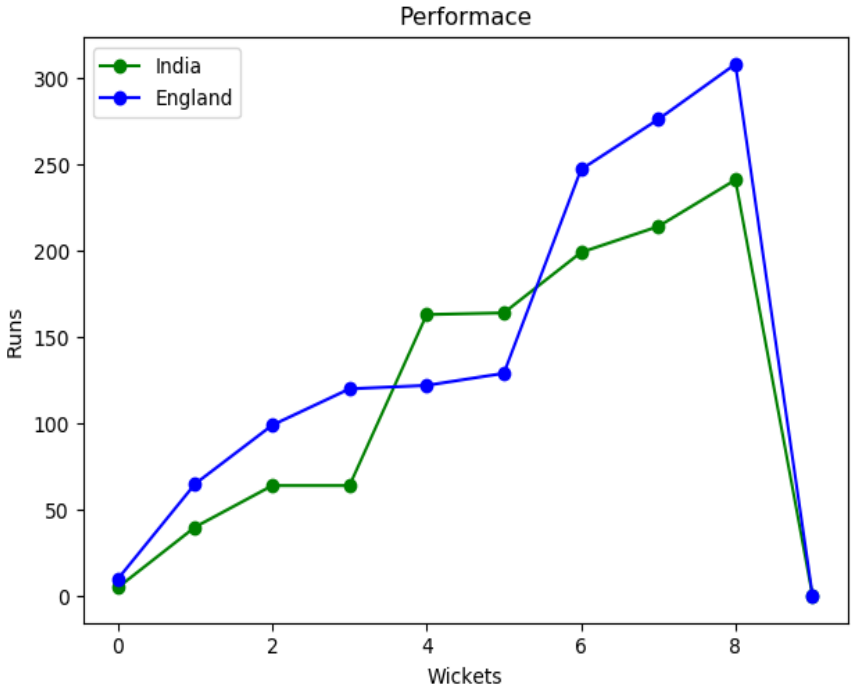
<table><tr><td>Data member name</td><td>Details</td></tr><tr><td>name</td><td>Name of customer</td></tr><tr><td>accountNum</td><td>Account Number</td></tr><tr><td>type</td><td>Account Type</td></tr><tr><td>amount</td><td>Amount deposited in the bank account</td></tr><tr><td>interest</td><td>Interest earned by the customer</td></tr></table>The class should support the following methods:
(a) __init__ for initializing the data members.
(b) deposit for depositing money in the members.
(c) withdrawal for withdrawing money from the account
(d) findInterest that determines the interest on the basis of amount in the account
<table><tr><th>Amount</th><th>Interest per annum (%)</th></tr><tr><td>>= 5,00,000</td><td>8</td></tr><tr><td>>= 3,00,000 and < 5,00,000</td><td>7</td></tr><tr><td>>=1,00,000 and <3,00,000</td><td>5</td></tr><tr><td><1,00,000</td><td>3</td></tr></table>
b. #Define a base class Person, having attributes name, birthdate and city. Define the class Student that derives from Person class which is having attributes like rollno, branch, totalMarks and year as data member. The class should contain the instance method __init__ and the abstract method percentage. Define two classes Grad and PostGrad which inherit from the base class Student. Both the classes should define their __init__ method which asks user t enter totalMarks value and should override the abstract method percentage of the superclass. Note that totalMarks obtained are out of 600 and 400 for Grad and PostGrad classes respectively.</td><td>1</td></tr>
<tr><td>5</td><td>8,9</td><td>Numpy and Scipy

a. As you know, a magic square is a matrix all of whose row sums, column sums and the sums of the two diagonals are the same. (One diagonal of a matrix goes from the top left to the bottom right, the other diagonal goes from top right to bottom left.) Show by direct computation that if the matrix A is given by
A=np.array([[17, 24, 1, 8, 15],
[23, 5, 7, 14, 16],
[4, 6, 13, 20, 22],
[10, 12, 19, 21, 3],
[11, 18, 25, 2, 9]])</td><td>2,3</td></tr>
</table>

<table>
<tr><td></td><td></td><td>The matrix A has 5 row sums (one for each row), 5 column sums (one for each column) and two diagonal sums. These 12 sums should all be exactly the same, and you could verify that they are the same by printing them and “seeing” that they are the same. It is easy to miss small differences among so many numbers, though. Instead, verify that A is a magic square by constructing the 5 column sums and computing the maximum and minimum values of the column sums. Do the same for the 5 row sums, and compute the two diagonal sums. Check that these six values are the same. If the maximum and minimum values are the same, the flyswatter principle says that all values are the same.
b. #Create scientific calculator using numpy API.</td><td></td></tr>
<tr><td>6</td><td>10</td><td>Matplotlib

Plot a line graph that shows in the figure for the given data. The runs scored between two-wicket fall in a one-day international match between India and England is generated using randomly. <u>Example:</u>

<table>
<tr><td>Fall of Wicket</td><td>1st</td><td>2nd</td><td>3rd</td><td>4th</td><td>5th</td><td>6th</td><td>7th</td><td>8th</td><td>9th</td><td>10th</td></tr>
<tr><td>India</td><td>5</td><td>35</td><td>24</td><td>0</td><td>99</td><td>1</td><td>35</td><td>15</td><td>27</td><td>14</td></tr>
<tr><td>England</td><td>10</td><td>55</td><td>34</td><td>21</td><td>2</td><td>7</td><td>118</td><td>29</td><td>32</td><td>10</td></tr>
</table>
<u>Plot:</u>

 
</td><td>2,3</td></tr>
<tr><td>7</td><td>11</td><td>Pandas:

a. Develop a python program that reads the data from a given CSV file, which is having phone usage data using a different branded mobile phone. Determine if the usage patterns for users differ between</td><td>2,3</td></tr>
</table>

<table>
<tr><td></td><td></td><td>different devices. For example, do users using Samsung devices use more call minutes than those using LG devices?</td><td></td></tr>
<tr><td>8</td><td>12,13</td><td>Statistical data analysis
a. Design a python program which performs the linear regression operation on the given data to predict the house price. Also, visualize the data for different attributes.
b. #Design a python program which implements the bisection and false positioning method.
c. #Design a python program that generates the 100 random variables and finds out the mean, median and mode for the same.</td><td>3</td></tr>
<tr><td>9</td><td>14</td><td>Image Processing:

a. Develop a python program that reads the image, display matrix representation of an image creates a histogram of the image and apply the smoothing effect on an image.
b. #Develop a python program which takes the video as an argument and extract all the frames from a video. Select specific frames and recreate the video, which has selected frames only.</td><td>3</td></tr>
<tr><td>10</td><td>15</td><td>Develop a web page using Django, which asks to upload the CSV file and month details from a user, which is having an attendance record of 50 employees of a company. Display the attendance record in HTML tabular form, which is showing details like employeeID, a Total number of days, Present Days and percentage details.

CSV details
E001, p,p,p,p,a,a,p……p
E002, p,a,p,p,p,p,p……p
E003, a,p,p,p,p,p,p……a
In HTML page the display looks like
<table><tr><th>EmpID</th><th>Total Days</th><th>Present Days</th><th>Percentage</th></tr><tr><td>E001</td><td>30</td><td>26</td><td>86.67%</td></tr><tr><td>E002</td><td>30</td><td>25</td><td>83.33%</td></tr><tr><td>E003</td><td>30</td><td>20</td><td>66.67%</td></tr></table></td><td>3</td></tr>
<tr><td>11</td><td>Extras + #indicates Practice practicals</td><td>Challenging practical list (Option)
1. Write a python program to perform a binary search tree algorithm.
2. Develop a python program for checking the typing speed test and show the accuracy along with word per minute.
3. Create a Sudoku game using python</td><td>3</td></tr>
</table>