SCHOOL OF ENGINEERING & TECHNOLOGY

BACHELOR OF TECHNOLOGY

OBJECT ORIENTED PROGRAMMING USING PYTHON

3RD SEMESTER

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Laboratory Manual

TABLE OF CONTENT

Sr. No	Experiment Title	Date of Performance	
1	**Basic Python Programming** 1. Create a program that asks the user for a number and then prints out a list of all the divisors of that number. (If you don't know what a divisor is, it is a number that divides evenly into another number. For example, 13 is a divisor of 26 because 26 / 13 has no remainder.) 2. Take two lists a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] b = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13] and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes. Write this using at least one list comprehension. Self: Randomly generate two lists to test this 3. Let's say I give you a list saved in a variable: a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]. Write one line of Python that takes this list and makes a new list that has only the even elements of this list in it. Self: Create list contains square of all odd numbers from range 1 to 10 Create list contains power of 2 from 1 to 8 Create list contains prime and non-prime in range 1 to 50 4. Make a two-player Rock-Paper-Scissors game. (Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game) Remember the rules: Rock beats scissors, Scissors beats paper, Paper beats rock 5. Write a program to input roll no, student name, marks of physics, chemistry and math out of 100. (0-100). Calculate total, percentage, calculate STATUS (pass, fail) if students' scores above 40 in all the 3 subjects the STATUS should be pass otherwise fail. Calculate GRADE if STATUS is pass. Grade must be based on percentage value if percentage is above 70, then grade must be DISTINCTION if percentage is above 60, then grade must be FIRST CLASS if percentage is above 50, then grade must be SECOND CLASS if percentage is above 40, then grade must be PASS CLASS		
2	**Basic Python Programming** 1. Write a program which inputs a number. Display that number in word format. Eg.459 –Four Five Nine7091 –Seven Zero Nine One26 -Two Six 2. Program to print binary form any number using 16-bit representation. (without library function) (You can use list for 16-bit representation) E.g. Enter any number: 20 0000000000010100		

Enter any number -51
000000000000101

3. Write a Python program to create a sequence where the first four members of the sequence are equal to one, and each successive term of the sequence is equal to the sum of the four previous ones. Find the Nth member of the sequence.
4. Write a Python program to find the number of divisors of a given integer is even or odd.
5. Write a Python program to check whether three given lengths (integers) of three sides form a right triangle. Print "Yes" if the given sides form a right triangle otherwise print "No".
6. Write a Python program to test whether two lines PQ and RS are parallel. The four points are P(x1, y1), Q(x2, y2), R(x3, y3), S(x4, y4).

Basic Python Programming

1. Write a program to display set of prime numbers between the given input range from user.
   Enter start number : 10
   Enter end number : 30
   11,13,17,19,23,29
2. Write a program to check whether inputted string is palindrome or not.
   E.g. Enter a name: liril
   Liril is a palindrome
3. Input data from keyboard in first 5 element. The last five elements must be
   a[5] =count of odd nos
   a[6]=count of even nos
   a[7] =sum of even nos
   a[8]=sum of odd nos
   a[9]=sum of first five
   Display the whole list
4. An equation of the form is known as the quadratic equation. The values of x that satisfy the equation are known as the roots of the equation. A quadratic equation has two roots which are given by the following two formula

$$root1 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$
$$root2 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

Write a program that requests the user to input the values of a, b, and c and outputs root1 and root2.
5. Write a program for lottery simulation. Generate 6-digit random number. Allow user to input only 6-digit number.
   If all the 6 digits matches then user wins 100000,
   if 5 digits match in sequence then user wins 85000,
   if 4 digits match in sequence then user wins 50000,
   if 3 digits matches in sequence then user wins 20000,
   if 2 digit matches user wins 2000.

Basic Python Programming

1. Write a program to print following pattern. (hint: nested for loop)
   Input number required no. of lines and pattern character from user.
   ```
   @@@@@@
   @@@@@
   @@@@
   @@@
   @@
   @
   ```

2. Write a OOP program to print following pattern. (hint: nested for loop)
   Input number required no. of lines and pattern character from user.
   ```
            @
           @@@
          @@@@@
         @@@@@@@
        @@@@@@@@@
       @@@@@@@@@@@
   ```

3. Write a program to print following pattern. (hint: nested for loop)
   Input number required no. of lines.
   ```
           1
          121
         12321
        1234321
       123454321
      12345654321
   ```

4. Write a Python program to construct the following pattern, using a nested for loop.
   ```
   *
   * *
   * * *
   * * * *
   * * * * *
   * * * *
   * * *
   * *
   *
   ```

5. We are making n stone piles! The first pile has n stones. If n is even, then all piles have an even number of stones. If n is odd, all piles have an odd number of stones. Each pile must more stones than the previous pile but as few as possible. Write a Python program to find the number of stones in each pile.
   Input: 2

4

Output:
[2, 4]
Input: 10
Output:
[10, 12, 14, 16, 18, 20, 22, 24, 26, 28]
Input: 3
Output:
[3, 5, 7]
Input: 17
Output:
[17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49]

6. Write a Python program find a list of integers with exactly two occurrences of nineteen and at least three occurrences of five
Input:
[19, 19, 15, 5, 3, 5, 5, 2]
Output:
True
Input:
[19, 15, 15, 5, 3, 3, 5, 2]
Output:
False
Input:
[19, 19, 5, 5, 5, 5, 5]
Output:
True

Class and Object-I

1. Write a OOP in python to input empid, name, basic salary, no. of experience in years. Calculate hra(35% of basic), da (58% of basic) and pf (9.5% of basic).
   Also calculate bonus based on experience in years.
   If experience in years is >= 30, bonus must be 59% of basic,
   If experience in years is >=23, bonus must be 51% of basic,
   If experience in years is >=15, bonus must be 45% of basic,
   If experience in years is >=7, bonus must be 33% of basic,
   If experience in years is <7, bonus must be 16% of basic
   Calculate netsalary as basic+da+hra-pf+bonus.

2. Write a OOP program to input Customer id, Customer name, electricity unit charges used.
   Calculate electricity bill according to the given condition:
   For first 50 units Rs. 0.50/unit
   For next 100 units Rs. 0.75/unit
   For next 100 units Rs. 1.20/unit
   For unit above 250 Rs. 1.50/unit
   An additional surcharge of 20% is added to the bill

3. Write an OOP to calculate exponent from inputted base and power value.
   E.g. Enter a base value : 3
   Enter a power value : 4
   For base 3 and power 4, the answer is 81
   Driver code:
   Base=MyNumber(3)
   Power=MyNumber(4)
   Exponent=Base^PowerExponent.display()
4. Write an OOP program to with list of 5 elements. Find the max from inputted numbers without using any library function.
5. Write an OOP program with list of 5 elements. Add a function in class to sort the elements in ascending / descending order.
   [Note: Don't use any library function to Sort the list elements]
6. Write a Python class to convert an integer to a roman numeral.
7. Write OOP program to calculate the area of triangle given its three sides. The formula or algorithm used is: Area = sqrt(s(s –a)(s –b)(s –c)), where s = (a + b + c) / 2 or perimeter / 2 and a, b & c are the sides of triangle.

Class and Object-II

1. Create a class Numerics in Python which contains
   a. Function to calculate factorial of a number.
   b. Function to display multiplication table of given number.
   NOTE: Do not use any library function.
2. Create a class in Python which contains
   a. Function to reverse a number.
   b. Function to check whether the number is palindrome or not.
3. Write a program which accepts the data of 5 cricket players(batsman)as follows.
   a. Name of the player
   b. Number of ODI's played/batted
   c. Total Runs scored by player in ODI
   Calculate the batting averages of all the players and display them. Also display the details of the players having maximum batting average and minimum batting average.
4. Design a voting application which imitates the current EVM's used in elections. In an EVM, add at least 4 candidates with necessary details like id, name of candidate, name of the party, no. of votes, etc. The voters can cast their votes in queue one by one. At the end provide facility to display results from EVM. Design appropriate classes for the required system.
5. Write a Python class to find a pair of elements (indices of the two numbers) from a given array whose sum equals a specific target number.
   Note: There will be one solution for each input and do not use the same element twice.
   Input: numbers= [10,20,10,40,50,60,70], target=50
   Output: 3, 4

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Abstract Class & Inheritance

1. Write a program, to create a child class Teacher (name, age) that will inherit the properties of Parent class Staff (role, department, salary)
2. Define a Base Class Vegetable having data member Color and member function getdata() which takes color as an input and putdata() which print the color as an output. Vegetable Class has one subclass named Tomato having data members weight and size and member function gtdata() which takes weight and size as an input and ptdata() which prints weight and size as output. Write a OOP Program which inherits the data of Vegetable class in Tomato class using Single Inheritance.
3. Write a program to create a class Medicine which stores type of medicine, name of company, date of manufacturing. Class Tablet is inherited from Medicine. Tablet class has name of tablet, quantity per pack, price of one tablet as members. Class Syrup is also inherited from Medicine and it has quantity per bottle, dosage unit as members. Both the classes contain necessary member functions for input and output data. Write an OOP program that enters data for tablet and syrup, also display the data. Use the concepts of Multiple Inheritance.
4. Write a program to create a class Bank Account, Inherit Bank Account to Savings Account and Fixed Deposit Account. The savings account should allow customer to deposit and withdraw. The fixed-deposit account must calculate the due amount by inputting principal, rate of interest and no. of years value. (Note: Decide on your own the static variables, member variables, constructors, methods/functions to be created within a program)
Output flow:

Bank of ABCD

Enter Account Number:
Enter Name of the account holder:
Choose your service from the option below (Enter your choice)
Savings Account
Fixed Deposit
Enter your choice: 1
Your balance is: 50000
Enter your transaction type
Withdrawal
Deposit
Enter your choice 1
Enter withdrawal amount: 20000
Now your balance is 30000
/////////////

Bank of ABCD

Choose your service from the option below (Enter your choice)
Savings Account
Fixed Deposit
Enter your choice : 2

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Enter Principal amount : 30000
Enter no. of years : 6
The bank rate currently 6.7%, you will receive 52000 after 6 years.
(Formula: A=P(1+R/100) N

5. Create an Abstract class vehicle having average as data and function getdata() and putdata(). Derive class car and truck from class vehicle having data members: fuel type (petrol, diesel, CNG) and no of wheels, respectively. Write an OOP program that enters the data of two cars and a truck and display the details of them.

6. Create abstract superclass Figure having abstract method def area (). Create concrete subclasses Rectangle and Circle of Figure which provide specific implementation of area () method. Rectangle has length and breadth data-members while circle has radius data member. Define parameterized constructors in both classes. In the driver part create objects of Rectangle and Circle classes with suitable length, breadth, and radius.

7. Create Following class Vehicle having data members name, maximum speed, mileage, seating capacity. Create a Bus and Car child class that inherits from the Vehicle class. The default fare charge of any vehicle is seating capacity * 100. If Vehicle is Bus instance, we need to add an extra 10% on full fare as a maintenance charge. So total fare for bus instance will become the final amount = total fare + 10% of the total fare.

Function and Operator Overloading

1. Write a program to overload +, ==, !=, -, * , >=, <= to perform operation between objects of MyNumber class. (Note : MyNumber class contains only one integer member variable)

2. Write an OOP program to accept two numbers and one mathematical operator. Calculate and display appropriate answer.
Eg output
Enter first number : 45
Enter mathematical operator : +
Enter second number : 60
45+60 = 105
Note: Make use of Operator overloading concept in python Operator overloading is accomplished by following operator mapped functions +: __add__ , *: __mul__ , /:__true div__ , -: __sub__ //: __floor Div__ , %: __mod__ , **: __pow__ ,

3. Write a OO program to find Euclidean Distance. Also overload minus (operator) to find the same.

INPUT-OUTPUT, MODULES & PACKAGES Files

1. Write an Object Oriented Program which reads texts from a file. It must display

file statistics a below.
   a. No. of sentences.
   b. No. of words.
   c. No. of total characters (Does not include whitespace)
   d. No. of whitespaces
   e. Total no. of digits, uppercase and lowercase letters.
2. Write an Object Oriented Program which copies the content of one file to another file in uppercase.
3. Write an Object-Oriented Program which creates vocabulary of words and counts each word in a document.
   Eg. Content
   The birds are flying. The boy is walking. The Ganges are a great river system. The Narmada River flows from rift valley.
   output:
   [(The,3), (birds,1), (are,1), (birds,1), (are,2), (flying,1), (boy,1), (river,2)]
4. Write an Object Oriented Program which imitates Banking Transaction for a Saving account on an ATM machine. Store Bank Customer details permanently in a file. The Software is operated by a Bank Customer through an ATM. After entering username and password (instead of card and pin), customer is allowed to view his details, Change his pin number, withdraw, deposit into his account. He must be able to transfer amount from his account to other also. (Use JSON data to handle a file)
   Below is the example flow
   Enter Username : Vrund
   Enter password : 123
   ////////////////////////////
   Name : Vrund
   Account no : 12345
   Balance : 45000
   Your Transaction
   1. Withdraw in-self
   2. Deposit in-self
   3. Deposit to Others
   4. password change
   Enter your choice : 1
   Enter Withdrawal Amount : 30000
   20000 is a limit at one go
   Now your balance is 28000
   Your Transaction
   1. Withdraw
   2. Deposit
   3. Deposit to Others
   4. password change
   Enter your choice: 1
   Enter Withdrawal Amount: 7000
   Transaction Successful

	Now your balance is 38000 Your Transaction 1. Withdraw 2. Deposit 3. Deposit to Others 4. password change Enter your choice: 3 Enter amount to be deposited to Others account: 10000 Enter account no of your beneficiary: 12323434 5. Write a python program mathfinder.py which finds sum, average, maximum, minimum value entered through command line arguments.		

10	**Database Programming**
	
	1. Design an online examination for only 10 questions. Allow user to login, on success should start examination. There is no time limit. After last question result should be displayed. Maintain result user wise in database. [Note- Add 10 question and its option directly in database and also add 3 to 4 users]
	2. Design Stationary Item class containing data members like itemid, itemname, itemprice, quantity in stock. The created instance of this class must be added to database tables. Design proper interface to interact with tables for performing all CRUD operation.
	3. Write an OO program for surveying internet users for spending their time in minutes per day on YouTube, WhatsApp, Instagram, e-commerce sites and browsing. Display maximum, minimum and average time spent by users on each category. [Note: Use database for storage of data]
	4. Using Pickle library, write an object-oriented program to perform CRUD operations on products object. Create a class which encapsulates Product information such as productId, productName and product Price. Store its object collection using dictionary to a file making use of Pickle library.
	5. Using Database file, design a voting application which imitates the current EVM's used in elections. In an EVM, add at least 4 candidates with necessary details like id, name of candidate, name of the party, no. of votes, etc. The voters can cast their votes in queue one by one. At the end provide facility to display results from EVM. Design appropriate classes for the required system. Store all information in MySQL Database file.
	  Welcome to EVM
	  1. Add Candidates
	  2. Start Voting
	  Enter your choice : 1
	  Enter Candidate ID: 111
	  Enter Candidate Name : Nayan
	  Enter Party Name : KJP
	  Candidate Added Successfully
	  1. Add Candidates
	  2. Start Voting		

	Enter your choice : 2 Voting Started 111 Nayan KJP 0222 Pallavi CJP 333 Taral YJP Enter id to vote : 222 Thank you for Voting, You may leave now Voting Started 111 Nayan KJP 222 Pallavi CJP 333 Taral YJP Enter id to vote : 111 Thank you for Voting, You may leave now Voting Started 111 Nayan KJP 222 Pallavi CJP 333 Taral YJP		
11	**EXTENDING AND EMBEDDING PYTHON** 1. Write a python program which invokes C function which does summation of all the values stored in 4X4 matrix.		