PSCP ASSIGNMENT II

(Evaluation: Ist week of november)

1 Define the following functions according to the prototypes given below:

int add2num(int, int);	void swap(int *, int *);
double add3num(double, double, double);	double power(int, int); #
int sub2num(int , int);	double average(a[10]); ##
int mul2num(int *, int *) ;	double stddev(a[10]);
double div2num(double *, double *);	double median(a[10]);

Note: # use recursive function; ## a[10] is an array of 10 integers;

Write a menu driven program in c++ that enables the user to use all of the above functions as per his choice. The program should continue till the user decides to quit.

2 The tower of hanoi is a mathematical puzzle. It consists of threerods, and a number of disks of different sizes which can slide-on to any rod. The puzzle starts with the disks in a neat stack in ascending order of size on one rod, the smallest at the top. We have to obtain the same stack on the third rod. Write a C++ program to solve the puzzle using recursive functions.

3 Write a program in C++ that defines the following:
(i)A function to convert polar to rectangular coordinates. The parameters r and theta giving the polar coordinates should be value parameters and the reference parameters x and y will be calculated. The formulas are x= r cos(θ) y=r sin(θ).
(ii) A function to convert from rectangular coordinates to polar coordinates r, θ . The formulas are r = sqrt($x^2 + y^2$) θ = arc tan(y/x).

4 Write a recursive function to calculate nth number in the Newman-Conway sequence defined by P(1) = P(2) = 1, and for n >= 3 P(n) = P(P(n-1))+ P(n-P(n-1))

5 Write a program that converts from 24-hour notation to 12-hour notation. For example, it should convert 14:25 to 2:25 PM. The input is given as two integers. There should be at least three functions, one for input, one to do the conversion, and one for output. Record the AM/PM information as a value of type char, 'A' for AM and 'P' for PM. Thus, the function for doing the conversions will have a call-by-reference formal parameter of type char to record whether it is AM or PM. (The function will have other parameters as well.) Include a loop that lets the user repeat this computation for new input values again and again until the user says he or she wants to end the program

6 Write a function that simulates coin tossing. For each toss of the coin , the program should print heads or tails. Let the program toss the coin 100 times and count the number of times each side of the coin appears and print the results. The program should call a separate function, *flip()*, that takes no arguments and returns 0 for tails and 1 for heads randomly.

7 Write a program in C++ to implement the following techniques using functions:
(i) to find whether the given string contains sub-string or not.
(ii) to count the number of occurrences of a given substring.
(iii)to replace all occurrences of given substring in the main string
Ex: Main-string - “the weather is very cool”
Sub-string - “the” replace with “hello”
Result: “hello weahellor is very cool”

8 An integer number is said to be a perfect number if the sum of its factors, including 1 is equal to the number. Write a function ‘*bool perfect(int)’* that determines whether the given number is perfect number or not.

9 Write a program that will allow two users to play tic-tac-toe. The program should ask for moves alternately from player X and player O. The program displays the game positions as follows:
1 2 3
4 5 6
7 8 9
The players enter their moves by entering the position number they wish to mark. After each move, the program displays the changed board. A sample board configuration is as follows:
XX O
4 5 6
O 8 9

10 Consider a character array of length 50. The array has only 2 symbols: ‘a’ and ’b’. Write a C++ program that lists all the palindromes of order ‘n’ in the array; $3 \le n \le 25$. Eg. If the user enters n=5, then the program should display strings such as ‘aaaaa’, ‘aabaa’, ‘ababa’, ‘baaab’... etc, if they exist in the array. If n = 10 then the program should display a substring of length 10 which is a palindrome (if exists).

11 Write a menu driven C++ program(using switch case) to do following matrix operation.

i. To input elements into matrix of size m x n
ii. To display elements of matrix of size m x n
iii. Sum of all elements of matrix of size m x n
iv. To display row-wise sum of matrix of size m x n
v. To display column-wise sum of matrix of size m x n
vi. To create transpose of matrix B of size n x m

User-defined functions which accept a 2-D array, and its size m and n as arguments, should be used in each case.

12 Write a program in C++ that stores 20 integers entered by a user in an array, and then computes the following using appropriate functions:
(i)smallest and Biggest elements (ii) n^{th} biggest and n^{th} smallest element
(iii) position of smallest and biggest element.

13 Hexadecimal numerals are integers written in base 16. The 16 digits used are '0' through '9' plus 'a' for the “digit 10”, 'b' for the “digit 11”, 'c' for the “digit 12”, 'd' for the “digit 13”, 'e' for the “digit 14”, and 'f' for the “digit 15”. For example, the hexadecimal numeral d is the same as base 10 numeral 13 and the hexadecimal numeral 1d is the same as the base 10 numeral 29. Write a C++ Program to perform addition of two hexadecimal numerals each with up to 10 digits. If the result of the addition is more than 10 digits long, then simply give the output message "Addition Overflow" and not the result of the addition. Use arrays to store hexadecimal numerals as arrays of characters. Include a loop to repeat this calculation for new numbers until the user decides to quit.

14 Write a program to perform the following string operations with out using the predefined functions in string.h file:
(i) length( ) (ii) reverse( ) (iii) tolower( ) (iv) toupper( ) (v) Stringcopy( ) (vi) check whether two strings are equal or not (vii) String concatenation

15 Write a program to read an array of ‘n’ elements. Sort the elements in the array, also remove duplicate elements and display the output.

16 Given an array of 10 two-digit numbers, develop a C++ program that does the following:
The elements in the even position should be shifted right (circular shift) by two positions and the elements in the odd position should be shifted left (circular shift) by two positions.
INPUT :

12	***23***	71	***34***	92	***43***	12	***67***	72	***88***

OUTPUT:

71	***88***	92	***23***	12	***34***	72	***43***	12	***67***

17 Write a C++ program that has functions of the following prototype: '*int AND(int* , int*);*' and '*int OR(int* , int*)*'; the functions perform bitwise AND and OR operations respectively. Illustrate the use of pointers.

18 Write a c++ program to create a structure student with the data fields; Name, rollno, address and marks in 3 subjects for 10 students and display all the students details.

19 Create a structure to specify data of customers in a shop. The data to be stored is: Cust_ID, Name, Items purchased and bill_amount. Assume that the shop has 100 customers. Write a function to print the Cust_ID and name of each customer with bill_amount greater than Rs. 1000.

20 Write a C++ program that creates a file to store the data entered in question 19. The user(shop owner) shoud be able to open the file and view the data at a glance. Each time new customers are added, the information should get appended to the same file.
(/ this question can be considered as an extention of Q. 24*/)*

21 Write a C++ program that reads the content of one text file (input.txt) that has three paragraphs. The program should create three text files and copy each paragraph of input.txt onto these files.

22 Consider that you are given an XML file as shown in the following figure:

```
<?xml version="1.0" standalone="yes" ?>
- <shop location="Birmingham" size="Large">
  - <food>
      <Name>Apple</Name>
      <type>fruit</type>
      <cost>15</cost>
    </food>
  - <food>
      <Name>Carrot</Name>
      <type>vegetable</type>
      <cost>10</cost>
    </food>
  </shop>
```

Write a c++ program that reads an XML file and displays only the attribute-values of the file and excludes the tags.
Eg: If the file shown in the figure is given as input, then the output is as follows:
Birmingham, Large, Apple, Fruit, 15, Carrot, vegetable, 10.

23 Create a text file (essay1.txt) and write one page about your hobby. Write a c++ program that reads essay1.txt and identifies all the articles (a, an, the) and prepositions (in, on, over, under, below, beside etc..) and writes it to a separate file out.txt.

For Questions 24–28, define a class to model the given **ITEM**. It should have appropriate constructors, methods to manipulate data members, input and output operations, and additional operations given in the problem

24 A **LINE** in the plane specified by a point on it in Cartesian coordinates (x, y) and its slope; additional operations: (a) determine if a given point is on the line; (b) find its equation—the point-slope equation of a line having slope m and passing through point P with coordinates (x1, y1) is y – y1 = m(x – x1); (c) find its x- and y-intercepts if they exist

25 A **LINE SEGMENT** in the plane specified by its endpoints in Cartesian coordinates (x, y); additional operations: (a) find its length; (b) find its midpoint; (c) find its equation;

26 A **CIRCLE** specified by its center and its radius; additional operations: (a) find its area; (b) find its circumference

27 A **DATE** consisting of a month name, day number, and year; additional operations: (a) difference between two dates; (b) determine if year is a leap year; (c) find number of days in the month

28 Information about a **PERSON**: name, birthday, age, gender, social security number, height, weight, hair color, eye color, and marital status.

29 Create a class named *Employee* with the following specifications:

- Instance variables to hold employees'details.
- A *void input()* function that reads employees' details such as name, address, basic pay, etc.
- An *int calculateSalary()* function that returns the salary of the employee. (Salary = Basic pay + 40% DA + 10 % HRA)
- An *int calculateloyalty()* function returns the loyalty score of an employee.

$$Loyalty\ Score = \frac{No.\ of\ awards + No.\ of\ foreign\ visits}{No.\ of\ days\ on\ leave + 1}$$

- An *void showMeritList() function that displays the score of students based on their* loyalty score in descending order.

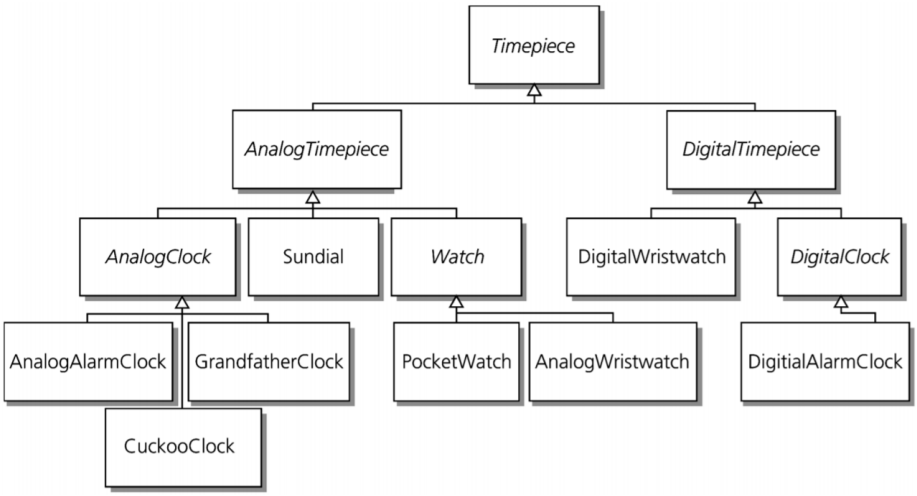
Using this outline, make necessary creative assumptions to write a C++ program to implement a employee management system.

30 Create a class 'Room', with attributes length, breadth and height each of which defaults to one. The class sholud have methods that calculate the area of the room and cost (Assume cost = Rs.250/Sq. feet). The class should also have methods to compare two rooms and return the difference in terms of size and cost.

31 Create a class *BigInt* that uses a 50 element array of digits to store integers as large as 50- digits each. Provide member functions, input big integer, output big integer, add big integers and subtract big integers. For comparing big integer objects provide functions **isEqualTo, isNotEqualTo, isGreaterthan, isLessthan, isGreaterthanOrEqualto, isLessthanOrEqualto.** Each of these is a predicate function which that simply returns true if the relationship holds between the two big integers and returns false if the relationship doesnot hold. Provide a predicate function **iszero** if you feel ambitious, also provide member functions multiply, divide and modulus big integers. Write a menu-driven program to facilitate the user to access all the functions of the class.

32 All living things are either plants or animals; Animals can be invertebrates or vertebrates; Invertebrates include unicellular creatures (Eg. Amoeba), worms(eg. Ringworm, flatworm), nematoads (eg. cockroach) etc.; Vertebrates include amphibians (eg. Frog, toad), reptiles (eg. lizard), birds and mammals (eg. Dogs, monkeys, human beings). Write a C++ program using object-oriented paradigms (inheritance) to represent this taxonomy and thereby create properties (data members) and functionalities (member functions) for each group. The user should able to choose an animal and therby view its charateristic features (data members) and its actions (member function). Eg. If the user chooses lizard, the output should be: "lizards are living things", "lizards are animals, reptiles", colour: brown, weight: 20 gms, lifespan: 5 days; "Lizards crawl on the ground".

33



Write a C++ program to represent each entity in the hierarchy shown in the figure as classes using object oriented paradigms. Use constructors to initialize properties (Eg. Cost, Weight, Dimensions). The user should be able to perform the following actions:

1. Add new instances of clocks, watches and timepieces
2. View existing items.
3. Modify the values and functionalities of all items.

(You can creatively add your own features and methods too.)

Programming Project 1:

Create a Music-file Management System (MMS) using C++. The MMS contains the details of all the music files in a standalone system. The features and requirements are as follows:

- The MMS provides the user with facilities to enter details of files and also view them.
- The details of a music file include file name, file location, date modified, album artist, album ID, Type(.mp3, wav, wma,etc), length (playing time in minutes), genre (classical, pop, rock, rap, gospel, bollywood)
- The MMS has a function , '*enter_records()',* that enables a user to enter the details of a music file.
- The function '*view_records()'* enables the user to view all the records stored in the MMS
- The MMS provides a *file_check()* function; the functions gets the file name as an input and returns true if the file is available in the specified file location.
- The MMS provides a *filter()* function; the functions gets a file attribute as an input and displays the files of that attribute. Eg. If the user enters classical then the function displays all the files whose genre is classical.
- When the user uses(executes) the MMS again, the details of the records need to be fetched from the same text files that have stored them. All insertions deletions and manipulations of records need to be saved and should be available to the user always.

Programming project 2:

Write a "quiz-tutor" program; the subject can be on a topic about which you are knowledgeable. The program should read a question and its answer from a file, display the question, and accept an answer from the user. If the answer is correct, the program should go on to the next question. If it is not correct, store the question in a list. When the file of questions is exhausted, the questions that were missed should be displayed again (in their original order). The answers which were correct in the first attempt should be given 3 points and those that are correct during the second attempt should be given 1 point. Keep a count of the correct answers and display the score (points earned). Display the correct answers if required. Add creative features such as a GUI, warning messages for time-outs etc.