Lab 7
Advanced Procedures

General Instructions:

- **All questions are compulsory.**
- **You cannot use inbuilt functions to calculate any mathematical series.**
- **The only inbuilt function you are allowed to use is power(m,n) which returns the value of m raised to n.**
- **It is guaranteed that input will be valid. You need not check edge cases. For example, we will not ask you to find ln 0.**
- **You can obviously make helper functions to calculate intermediate values.**
- **There is no partial marking.**
- **All the best!**

Q.1) For a given value of x and n, find the value of
$$f(x) = \tan x + \ln(1 + x)$$
You need to use the following to compute the value of the function.
$$\tan x = (\sin x)/(\cos x)$$
and

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots\ldots\ldots ((-1)^{n+1}x^{2n-1})/(2n-1)!$$

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots\ldots\ldots ((-1)^{n+1}x^{2n-2})/(2n-2)!$$

$$\ln(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots\ldots\ldots ((-1)^{n+1}x^n)/n$$

Here, n is the number of terms for each of the expansions and x is the value at which you need to calculate the value of the function. You need to make a procedure which takes in x and n as input variables and prints the result.

[20m]

Q.2) For given values of c_1, c_2, c_3 and c_4 and a given n, find the value of the following recursive sequence defined as follows –

$$a_n = e^{c1}a_{n-1} + e^{c2}a_{n-2} + e^{c3}a_{n-3} + e^{c4}a_{n-4}$$

with given initial conditions, $a_1 = 0, a_2 = 0, a_3 = 1, a_4 = 1$
Also, e^x for this question is defined as follows –

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!}$$

You need to print the value of a_n as the final answer. It is guaranteed that the input n will be greater than or equal to 5.

[8m]

Q.3) Find the type (i.e., car loan or home loan or personal loan) and the cities of their respective branches for those loans whose some of the payment has been made.

[Hints: Iterate through the payment table and find the type of the loans and the cities.

Limit x,y : outputs first y rows starting from the row number x.

Locate(substring, string): find the first location of the substring in the string. The starting position is 1. If substring is not present, it gives 0 as output.

Eq: Locate ('at','attitude') = 1]

[12m]