Question 1

Here, I have found the program execution time for two cases:
1. To print fibonacci series till the 55th term.
2. To print fibonacci series till the 100th term.

Method used	Till 55th term(in ns)	TIll 100th term(in ns)	Till 55th term(in sec)	TIll 100th term(in sec)
Using recursion	1266861511155	1.744402979 * 10^22	1266.861511	1.744402979 * 10^13
Using loop	58208	108009	0.000058208	0.000108009
Using recursion and memoization	53669	110637	0.000053669	0.000110637
Using loop and memoization	58843	125665	0.000058843	0.000125665

Note: I was not able to calculate the time for printing till the 100th term using recursion practically since it was taking longer than 12 hours to execute. After calculating the theoretical value of execution time for printing till the 100th term using recursion it was found that it can't be executed with the laptop configuration I have. Thus, I have calculated the theoretical value of execution time to print fibonacci series till the 100th term.

Calculation of execution time to print till 100th term using recursion.
Time taken to print till 55th term = 1266861511155 nanoseconds.
Time complexity of program = O(1.68^n)

Assumption: TIme required to execute individual steps remains constant with number of iterations over function.

Thus,
Total time required = Time taken to print till 55th term * 1.68^45
$\qquad$ = 1266861511155 * 1.68^45
$\qquad$ **= 1.744402979 * 10^22 nanoseconds**
$\qquad$ **= 1.744402979 8 10^13 seconds.**

Speedup of all programs(keeping program(1) as reference):

Method used	Speedup(till 55th term)	Speedup(till 100th term)
Using recursion	1	1
Using loop	0.0000000459466165	0
Using recursion and memoization	0.00000004236374658	0
Using loop and memoization	0.00000004644785518	0

From the first table, we can see that time taken for execution of the 100th term using recursion is infinitesimal in comparison to time taken by other methods. Thus, when calculated in a sheet, the ratio is very small and hence the system returns zero.