MAHARAJA AGRASEN INSTITUTE OF TECHNOLOGY

FIRST TERM (B.TECH CSE) **Assignment I – CSE (V Semester)**

COURSE CODE: ETCS-301

COURSE TITLE: ALGORITHM ANALYSIS AND DESIGN

Q1: If $f(n)=a_m n^m+a_{m-1}n^{m-1}+\ldots\ldots+a_1 n+a_0$, then prove $f(n)=O(n^m)$

Q2: If $f(n)=a_m n^m+a_{m-1}n^{m-1}+\ldots\ldots+a_1 n+a_0$ & $a_m > 0$ then prove $f(n)=\Omega(n^m)$

Q3. If $f(n)=a_m n^m+a_{m-1}n^{m-1}+\ldots\ldots+a_1 n+a_0$ & $a_m > 0$ then prove $f(n)=\Theta(n^m)$

Q4. Solve the following recurrence relations:

a) $T(n) = 3T(n/2) + n^2$

b) $T(n) = 16T(n/4) + n$

c) $T(n) = 2T(n/4) + n^{0.51}$

d) $T(n) = 3T(n/4) + n \log n$

e) $T(n) = 4T(n/2) + n / \log n$

f) $T(n) = 7\, T(n/3) + n^2$

h) $T(n) = T(\sqrt{n}) +1$

i) $T(n)=T(9n/10)+n$

j)$T(n)=16\,T(n/4)+n^2$

k)$T(n)=7T(n/3)+n^2$

l) $T(n) = 3T(n/2) + n \log n$

Q5: Prove that $\lg(n!)=O(n\lg n)$

Q6:Is $2^{n+1}=O(2^n)$?

Q7. Devise a divide and conquer algorithm to find the maximum and minimum element of an array A [p-------r]. Also give the recurrence relation.

Q8. Prove the master's theorem.

Q9. Derive the time complexity of Strassen Matrix Multiplication

Q.10. How Randomized quicksort is better than standard quicksort. Explain with an example.