**Assignment 1**

**R-1.1 Graph the functions 12n, 6n log n, n 2 , n3 , and 2n using logarithmic scale for the x and y-axes; that is, if the function value f(n) is y, plot this as a point with x-coordinate at log n and y-coordinate at log y.**

**R-1.2 Algorithm A uses 10n log n operations, while algorithm B uses n2 operations. Determine the value n0 such that A is better than B for n ≥ n0.**

Ans: For A,

f(n) = 10n log n

**f(n) <= c(g(n)) for n>=n0**

10n log n <= 11n log n

1 <= n log n

1/ log n <= n

Since log 1 = zero, we should have n=2 , n0 = 1 and c = 11

For B,

F(n) = n2

**f(n) <= c(g(n)) for n>=n0**

n2 <= 2n2

0 <= n2

**R-1.6 Order the following list of functions by the big-O notation.**

Ans:

log log n

n log n

2n log 2 n

1/n

√n

5n

4n 3/2

n 2 log n

4 log n

n 3

2 n

4 n

**R-1.10 Give a big-O characterization, in terms of n, of the running time of the Loop1 method below:**

**Algorithm Loop1(n)**

**s ← 0 1**

**for i ← 1 to n n**

**do s ← s + i n**

Ans: The running time is O(n).

**R-1.14 Perform a similar analysis for method Loop5 below:**

**Algorithm Loop5(n)**

**s ← 0 1**

**for i ← 1 to n 2 do n**

**for j ← 1 to i do n2**

**s ← s + i n2**

Ans: The running time is O(n2 )

**Prove: log b Xa = a log b x**

Ans:

We can use the product rule

log\_bXa = log\_b (X.X.X…….X) X multiplied a times Definition of exponents

= log\_bX+ log\_bX+ log\_bX……….. log\_bXa timesProduct rule

= a. log\_bX