Assignment # 1

Q 1): Solve the following recurrence relations using **master theorem**, showing all the steps.
[10+10+10+10+10+10 Marks]

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

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

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

4) $T(n) = 2\,T(n/2) + n^{0.55}$

5) $T(n) = 3\,T(n/3) + \sqrt{n}$

6) $T(n) = \sqrt{2}\;\; T(n/2) + \log n$

Q 2): Solve the following recurrence relations using **recursion tree**:
[10+10+10+10 Marks]

1) $T(n) = 2T(n/3) + cn$

2) $T(n) = T(n/3) + T(2n/3) + n.$

3) $T(n) = T(n-1) + T(n-2) + c$

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

Q 3): Write algorithms corresponding to above (Q 2) **recurrence relations**.
[10+10+10+10 Marks]

Q 4): Prove that following is true using **substitution method**.
[10+10+10 Marks]

1) $T(n) = 2\,T(n/2) + c\,n$ is $\Omega(n \log n)$.

2) $T(n) = 2\,T(n/2) + c\,n$ is $O(n \log n)$.

3) $T(n) = 8\,T(n/2) + c\,n^2$ is $O(n^3)$

Q 5): On which one of the following master theorem cannot be applied and if so then why?
[10+10+10+10+10+10 Marks]

1) $T(n) = 2\ T(n/3) + n^3$

2) $T(n) = 4\ T(3n/5) + n$

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

4) $T(n) = 0.5\ T(n/7) + c$

5) $T(n) = T(5n/3) + n$

6) $T(n) = 2\ T(n/3) - n^2$