Assignment 1
Autumn 2017 **CS60007: Algorithm Design & Analysis** **July 25, 2017**

Name : Roll no. :

---

1. Answer all questions.
2. All parts of a particular question should be answered together.
3. Credits will be given for neat and to-the-point answering.
4. Unnecessary / confusing words are liable to negative marking.

---

1. What is the worst case time complexity of the following Code : (3)

```
int j=0;
for(int i = 0; i < n ; i++)
{
  while(j < n && arr[i] < arr[j])
  {
    j++;
  }
}
```

2. Let $f(n) = n$ and $g(n) = n^{1+sin(n)}$.Find the aysmtotic relation between $f(n)$ and $g(n)$. (5)

3. What is the worst case time complexity of the following function : (3)

```
int fun(int n)
{
  int count = 0;
  for(int i = n; i > 0; i /= 2)
  {
    for(int j = 0; j < i; j++)
      count += 1;
  }
  return count;
}
```

4. Decide whether the following equation is **True, False or Sometimes true**.If it is **True** then provide a clean proof. If it is **False** then give a counter example.If it is **Sometimes true** then provide a example for both true and false. (3)

   $f(n) = O(f(n)^2)$

5. Solve the recurrence equation $T(n) = T(n/3) + T(n/6) + \theta(n\sqrt{lg(n)})$ (3)

6. Prove $lg(n!) = \theta(nlg(n))$ (5)