CS105L: Discrete Structures
I semester, 2006-07

Homework # 8

Due before class on **Friday, October 6th, 2006**

Instructor: Amitabha Bagchi

September 28, 2006

1. Count the following:
   (a) The number of 1-regular graphs on n vertices.
   (b) The number of 2-regular graphs on n vertices.
   (c) The number of paths of length k between two vertices u and v in a complete graph on n vertices.
   (d) The number of bipartite graphs on n vertices.

2. For some natural number d, let's say the vertex set of a graph is labelled with the strings from $\{0, 1\}^d$ i.e. each vertex has a unique label which is a d-bit string and every d-bit string corresponds to a vertex. Further we say that there's an edge between two vertices if their labels differ in exactly one position. This graph is known as the *d-dimensional cube.* Determine the average degree, number of edges, diameter, girth and circumference of this graph. Give proofs of all your claims.

3. Show that a graph is bipartite if and only if every induced cycle has even length.