**Tutorial 3**

**GC 312**

**Problem 1:**

Consider a disk with the following characteristics (these are not parameters of any particular disk unit): block size B=512 bytes, interblock gap size G=128 bytes, number of blocks per track=20, number of tracks per surface=400. A disk pack consists of 15 double-sided disks.

(a) What is the total capacity of a track and what is its useful capacity (excluding interblock gaps)?

(b) How many cylinders are there?

(c) What is the total capacity and the useful capacity of a cylinder?

(d) What is the total capacity and the useful capacity of a disk pack?

(f) Suppose the average seek time S is 30 msec, rotational delay rd is 12.5 msec and the block transfer time btt is 1 msec. How much time does it take (on the average) in msec to locate and transfer a single block given its block address?

(g) Calculate the average time it would take to transfer 20 random blocks and compare it with the time it would take to transfer 20 consecutive blocks using double buffering to save seek time and rotational delay.

**Problem 2:**

 A file has r=20,000 STUDENT records of fixed-length. Each record has the following fields: NAME (30 bytes), SSN (9 bytes), ADDRESS (40 bytes), PHONE (9 bytes), BIRTHDATE (8 bytes), SEX (1 byte), MAJORDEPTCODE (4 bytes), MINORDEPTCODE (4 bytes), CLASSCODE (4 bytes, integer), and DEGREEPROGRAM (3 bytes). An additional byte is used as a deletion marker. The file is stored on the disk whose parameters are given in Problem 1.

(a) Calculate the record size R in bytes.

(b) Calculate the blocking factor bfr and the number of file blocks b assuming an unspanned organization.

**Problem 3:**

Suppose that a disk unit has the following parameters: seek time s=20 msec; rotational delay rd=10 msec; block transfer time btt=1 msec; block size B=2400 bytes; interblock gap size G=600 bytes. An EMPLOYEE file has the following fields: SSN, 9 bytes; LASTNAME, 20 bytes; FIRSTNAME, 20 bytes; MIDDLE INIT, 1 byte; BIRTHDATE, 10 bytes; ADDRESS, 35 bytes); PHONE, 12 bytes); SUPERVISORSSN, 9 bytes; DEPARTMENT, 4 bytes; JOBCODE, 4 bytes; deletion marker, 1 byte. The EMPLOYEE file has r=30000 STUDENT records, fixed-length format, and unspanned blocking. Write down appropriate formulas and calculate the following values for the above EMPLOYEE file:

(a) The record size R (including the deletion marker), the blocking factor bfr, and the number of disk blocks b.

(b) Calculate the wasted space in each disk block because of the unspanned organization.

**Problem 4:**

A PARTS file with Part# as hash key includes records with the following Part# values: 2369, 3760, 4692, 4871, 5659, 1821, 1074, 7115, 1620, 2428, 3943, 4750, 6975, 4981, 9208. The file uses 8 buckets, numbered 0 to 7. Each bucket is one disk block and holds two records. Load these records into the file in the given order using the hash function h(K)=K mod 8.