# Homework 8

# 1.

Each node has N keys and N+1 pointers.

Records = 20000, Key field 40-byte string Pointers = 20 bytes

Size of disk page = 1000 bytes

40N + 20(N+1) = 1000

40N + 20N + 20 = 1000

60N = 980 N

= 16

We have 16 keys and 17 pointers.

Size of record = 40 + 20 = 60 bytes Leaf page space = 1000/60 = 16

Levels = log17(20000/16) + 1 = 3.52 ~ 4 levels

**THUS, RESULTING TREE WILL HAVE 4 LEVELS**

# 2.

NUMBER OF LEAF NODES ON LEVEL 4 = 20000/16 = 1250

NUMBER OF LEAF NODES ON LEVEL 3 = 1250/17 = 73

NUMBER OF LEAF NODES ON LEVEL 2 = 73/17 = 4

LEVEL 1 IS THE ROOT NODE

**THUS, EACH LEVEL 1250, 73,4 AND 1 NODES WILL BE THERE RESPECTIVELY.**

# 3.

Key size in each node = 10 Bytes

New leaf page capacity = (1000 - 20) / (10 + 20) = 980 / 30 ≈ 33 records

Levels = log17(20000 / 33) + 1 = 3.16 ~ 3 levels

**SO, WITH KEY COMPRESSION REDUCING THE AVERAGE SIZE OF EACH KEY TO 10 BYTES, THE RESULTING B+ TREE WOULD STILL HAVE APPROXIMATELY 3 LEVELS.**