Question 3. (8+8+4=20 Marks)

(a) You have to store information about each student in a group of **about 200** students in a hash table. Each student's key is his id. Number , for example, 427102181.

(i) Give a suitable table size and a hash function based on **digit selection**, assuming that **the external chaining** is the collision resolution strategy employed.

(ii) Give a suitable table size and a hash function based on division if the number of students is exactly 200 and **linear rehashing** is the collision resolution strategy employed.

(b) Insert the following keys: 904,918,855,913,806,841 and 778, into a hash table with hash function ***H(key) = key mod*** 7, using linear rehashing as collision resolution strategy.

(c) How many probes are required to store 913 and 841?

Q3 –a/i)

Table Size = 100 since we are using External chaining for the collision resolution strategy.
H(key) = key mod 100.

Q3 –a/ii)

Table Size = 200 since we are using linear rehashing is the collision resolution strategy
H(key) = key mod 200.

Q3 –b and c)

E	E	E	E	E	E	E
0	1	2	3	4	5	6

Insert Key 904: H(904) = 904 mod 7 = 1 **Props = 1**

E	904	E	E	E	E	E
0	1	2	3	4	5	6

Insert Key 918: H(918) = 918 mod 7 = 1 **Collision in index 1.**
Rehash = p + c mod tableSize = 1 + 1 mod 7 = 2 **Props = 2**

E	904	918	E	E	E	E
0	1	2	3	4	5	6

Insert Key 855 : H(855) = 855 mod 7 = 1 **Collision in index 1.**
Rehash = p + c mod tableSize = 1 + 1 mod 7 = 2 **Collision in index 2.**
Rehash = p + c mod tableSize = 2 + 1 mod 7 = 3 **Props = 3**

E	904	918	855	E	E	E
0	1	2	3	4	5	6

Insert Key 913: H(913) = 913 mod 7 = 3 **Collision in index 3.**
Rehash = p + c mod tableSize = 3 + 1 mod 7 = 4 **Props = 2**

E	904	918	855	913	E	E
0	1	2	3	4	5	6

Insert Key 806 : H(806) = 806 mod 7 = 1 **Collision in index 1.**
Rehash = p + c mod tableSize = 1 + 1 mod 7 = 2 **Collision in index 2.**
Rehash = p + c mod tableSize = 2 + 1 mod 7 = 3 **Collision in index 3.**
Rehash = p + c mod tableSize = 3 + 1 mod 7 = 4 **Collision in index 4.**
Rehash = p + c mod tableSize = 4 + 1 mod 7 = 5 **Props = 5**

E	904	918	855	913	806	E
0	1	2	3	4	5	6

Insert Key 841: H(841) = 841 mod 7 = 1 **Collision in index 1.**
Rehash = p + c mod tableSize = 1 + 1 mod 7 = 2 **Collision in index 2.**
Rehash = p + c mod tableSize = 2 + 1 mod 7 = 3 **Collision in index 3.**
Rehash = p + c mod tableSize = 3 + 1 mod 7 = 4 **Collision in index 4.**
Rehash = p + c mod tableSize = 4 + 1 mod 7 = 5 **Collision in index 5.**
Rehash = p + c mod tableSize = 5 + 1 mod 7 = 6 **Props = 6**

E	904	918	855	913	806	841
0	1	2	3	4	5	6

Insert Key 778 : H(778) = 778 mod 7 = 1 **Collision in index 1.**
Rehash = p + c mod tableSize = 1 + 1 mod 7 = 2 **Collision in index 2.**
Rehash = p + c mod tableSize = 2 + 1 mod 7 = 3 **Collision in index 3.**
Rehash = p + c mod tableSize = 3 + 1 mod 7 = 4 **Collision in index 4.**
Rehash = p + c mod tableSize = 4 + 1 mod 7 = 5 **Collision in index 5.**
Rehash = p + c mod tableSize = 5 + 1 mod 7 = 6 **Collision in index 6.**
Rehash = p + c mod tableSize = 6 + 1 mod 7 = 0. **Props = 7**

E	904	918	855	913	806	841
0	1	2	3	4	5	6