

Date: \_\_\_\_\_

Aisha Muhammad Nawaz

20L-0921

Title: \_\_\_\_\_

PAGE # 1

BSCS-6A Advance Database Concepts

Assignment #2

Total pages: 9

Question 1:

(a) File is not ordered

\* Rollno is unique

Number of records,  $r = 10,000,000$

Record size,  $R = 100$  bytes,  $B = 1024$  bytes <sup>Block size</sup>

$$\text{Blocking Factor, } bfr = \left\lfloor \frac{1024}{100} \right\rfloor = 10 = \left\lfloor \frac{B}{R} \right\rfloor$$

$$\text{Total Number of blocks} = \left\lceil \frac{10,000,000}{10} \right\rceil = 1,000,000$$
$$= \left\lceil \frac{r}{bfr} \right\rceil$$

$O(n)$

$n = 10,000,000$  where  $n$  is number of blocks

(b) File is ordered on rollno

\* Rollno is unique

$$\log_2(n) = \left\lceil \log_2(10,000,000) \right\rceil = 20 \text{ Blocks}$$

(c) File is not ordered

Each department number is repeated 50,000 times

$$n = 10,000,000$$

(d) File is ordered on deptno

Each department no is repeated 50,000 times

$$= \log_2(n) + \frac{s}{bfr} - 1$$

$$= \log_2(10,000,000) + \left( \frac{50,000 - 1}{10} \right) = 50.19 \text{ Blocks}$$

$$2 \bmod 6 = 2$$

$$h(k) = k \bmod 6$$

Date: \_\_\_\_\_

Title: \_\_\_\_\_

Each bucket has capacity of 3 records

### Question 2

(a).

Step #1

Record pointer  
(overflow buckets)

Bucket 0					Null
Bucket 1	7	19			Null
Bucket 2	2				Null
Bucket 3	3				Null
Bucket 4					Null
Bucket 5	5	11	17		Null

$$2 \bmod 6 = 2, \quad 3 \bmod 6 = 3, \quad 5 \bmod 6 = 5$$

$$7 \bmod 6 = 1, \quad 11 \bmod 6 = 5, \quad 17 \bmod 6 = 5$$

$$19 \bmod 6 = 1, \quad 23 \bmod 6 = 5 \rightarrow \text{overflow bucket needed}$$



Record pointer (overflow buckets)

Bucket 0					Null
Bucket 1	7	19	31		Null
Bucket 2	2				Null
Bucket 3	3				Null
Bucket 4					Null
Bucket 5	5	11	17		

$$29 \bmod 6 = 5$$

→ goes to overflow bucket

overflow buckets	Record pointer
23	Null
29	Null

$$31 \bmod 6 = 1$$

(b).

Average Number of block access

$$= \frac{1}{210} \left( \frac{8}{10} \right) + \frac{2}{210} \left( \frac{2}{10} \right)$$

In Buckets
In overflow Buckets

$$= 1.2$$

⇒ 2 Block access

Date: \_\_\_\_\_

(Storing MSB)

$$\text{Step 1: } 2 \bmod 7 = 2 \quad (010)$$

$$3 \bmod 7 = 3 \quad (011)$$

$$5 \bmod 7 = 5 \quad (101)$$

$$7 \bmod 7 = 0 \quad (000)$$

$$11 \bmod 7 = 4 \quad (100)$$

$$17 \bmod 7 = 3 \quad (011)$$

$$19 \bmod 7 = 5 \quad (101)$$

$$23 \bmod 7 = 2 \quad (010)$$

$$29 \bmod 7 = 1 \quad (001)$$

$$31 \bmod 7 = 3 \quad (011)$$

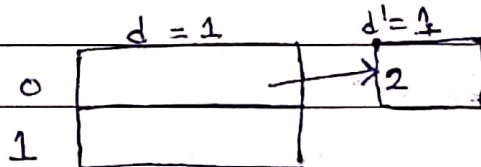
Question 2 continued ....

(C) (max 3 records in one bucket)

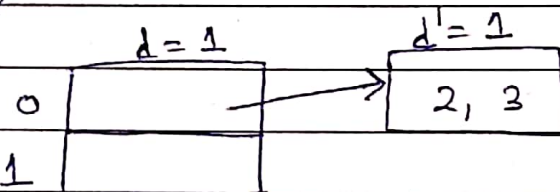
Extendible Hashing

$$h(K) = K \bmod 7$$

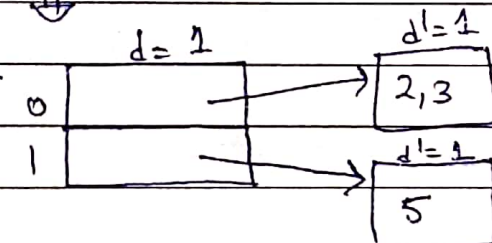
Step #1



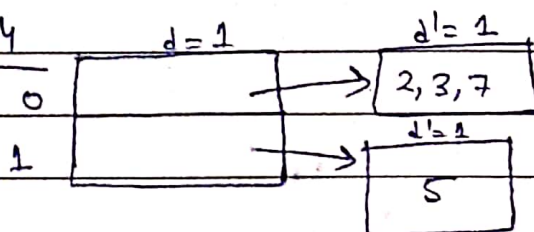
Step #2



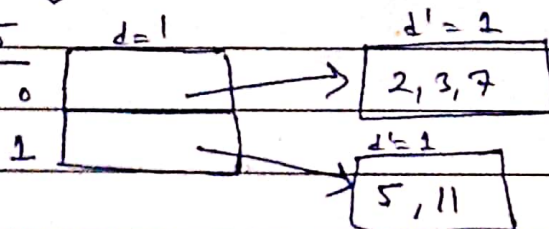
Step #3



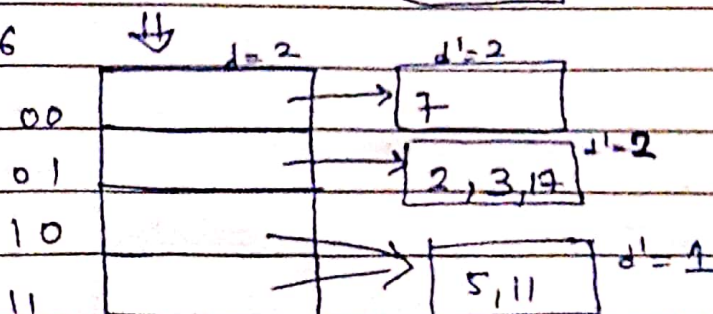
Step #4



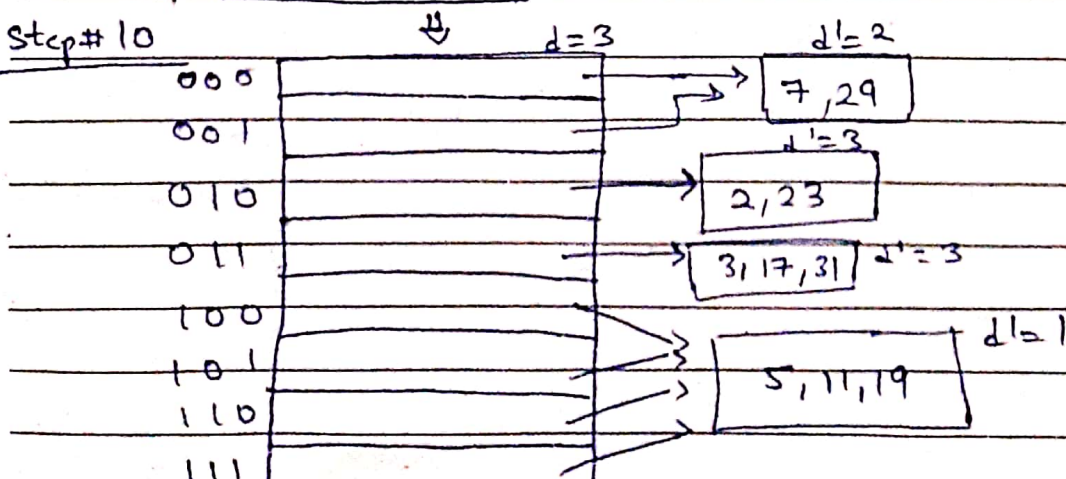
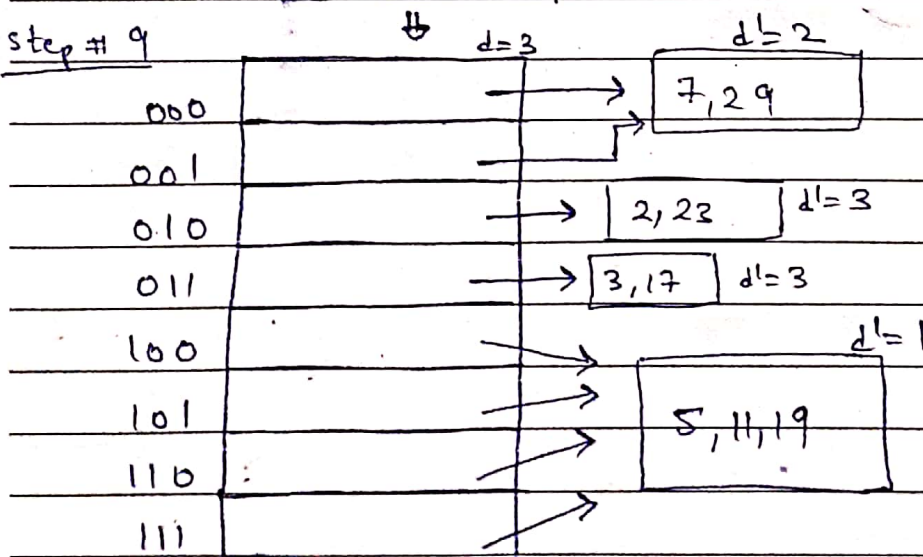
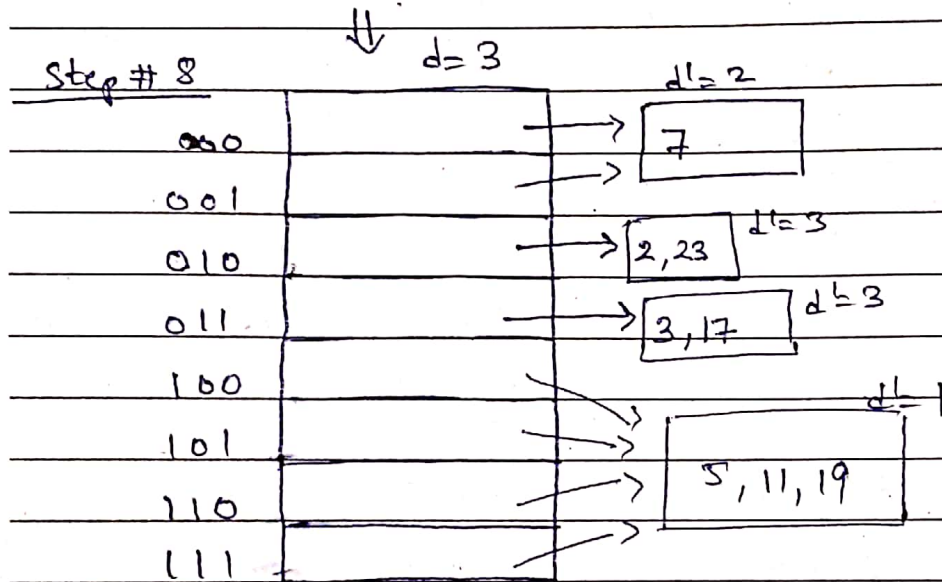
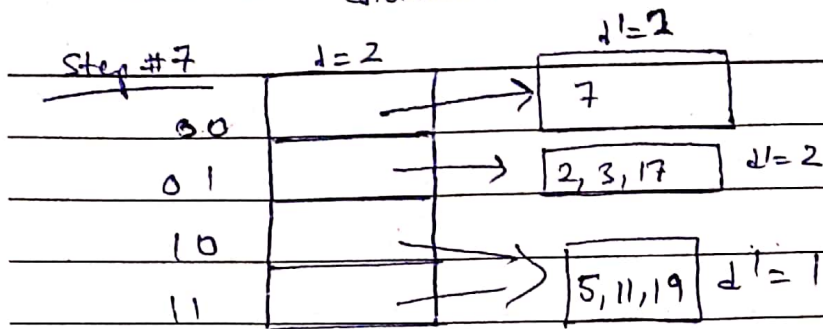
Step #5



Step #6

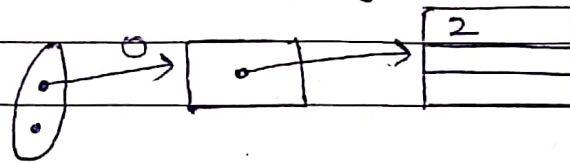




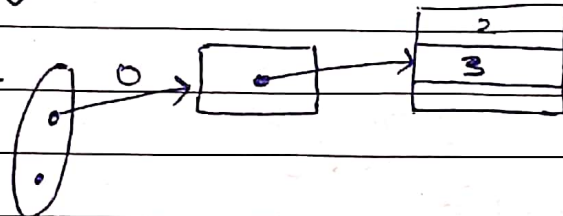
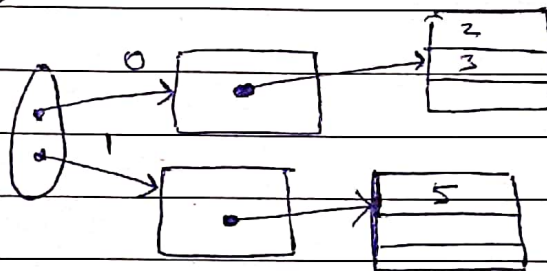
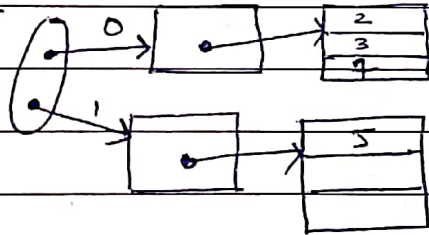
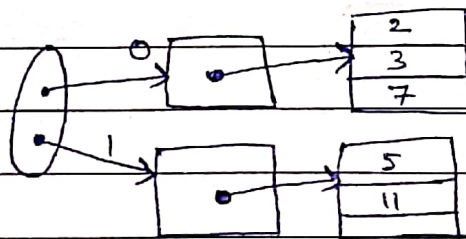


Date: \_\_\_\_\_

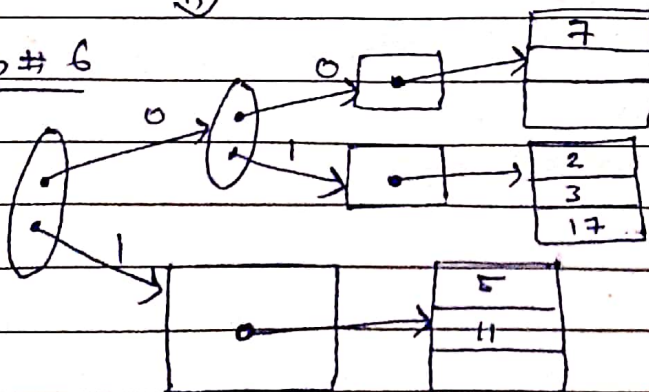
Title: \_\_\_\_\_

Question #2 continued.....(d). Dynamic Hashing,  $h(K) = K \bmod 7$ , max 3 records in each bucketStep #1

⇓

Step #2Step #3Step #4Step #5

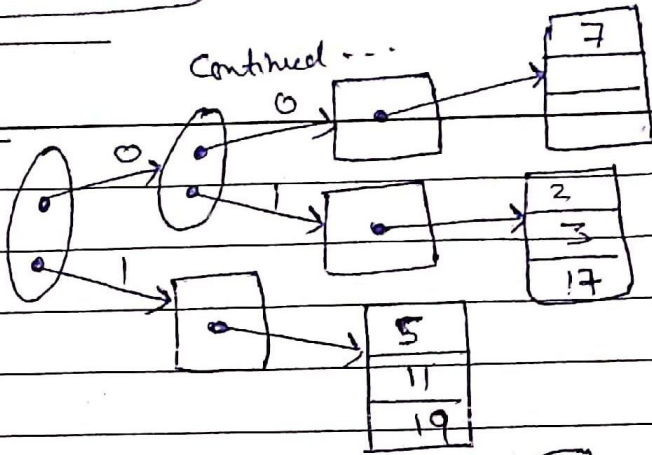
⇓

Step #6

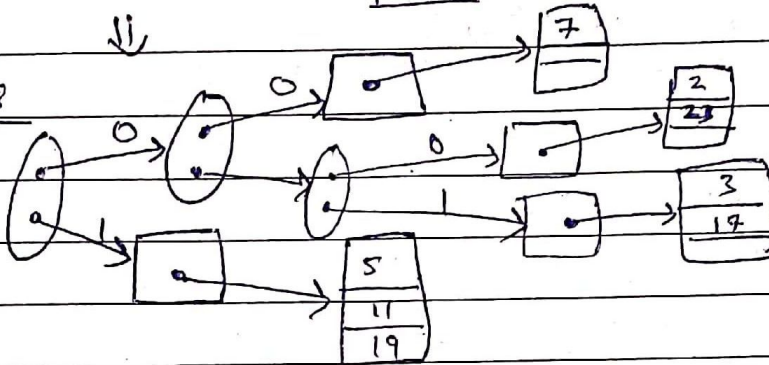
Date: \_\_\_\_\_

Title: \_\_\_\_\_

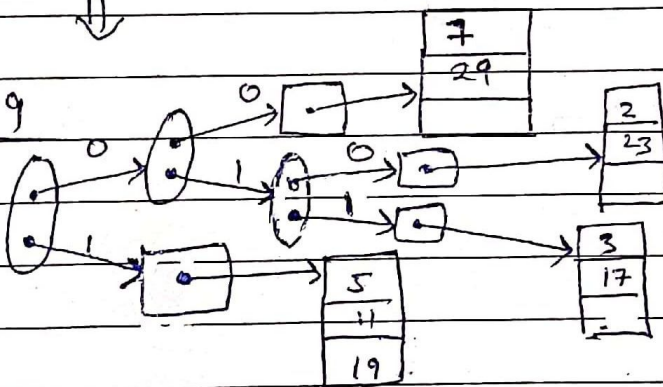
Step # 7



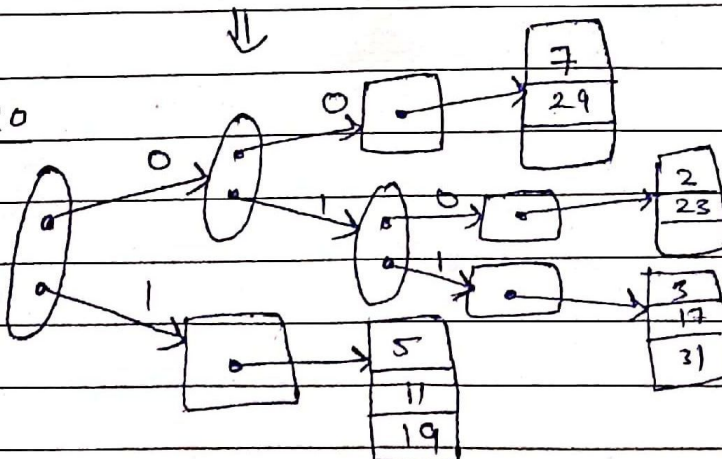
Step # 8



Step # 9



Step # 10





Date: \_\_\_\_\_

Question #2 continued...

Title: \_\_\_\_\_

②. Linear Hashing

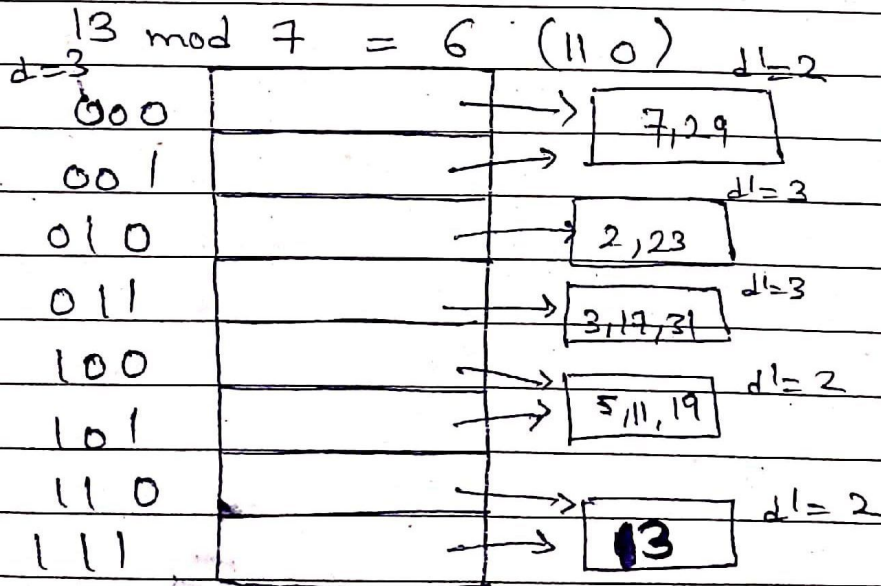
$$h(K) = K \bmod 7$$

max 3 records  
in one bucket

$n=0$	0	7		
	1	29		
	2	2	23	
	3	3	17	31
	4	11		
	5	5	19	
	6			
	7			

$$\begin{aligned}
 2 \bmod 7 &= 2, & 3 \bmod 7 &= 3, & 5 \bmod 7 &= 5, & 7 \bmod 7 &= 0 \\
 11 \bmod 7 &= 4, & 17 \bmod 7 &= 3, & 19 \bmod 7 &= 5 \\
 23 \bmod 7 &= 2, & 29 \bmod 7 &= 1, & 31 \bmod 7 &=
 \end{aligned}$$

③.



Date: \_\_\_\_\_

Question 2 continued ---

Title: \_\_\_\_\_

(8)

$$18 \bmod 7 = 4 \quad (100)$$

000	$d=3$	$d'=2$	7, 29
001		$d'=3$	2, 23
010		$d'=3$	3, 17, 31
011		$d'=3$	11, 18
100		$d'=3$	5, 19
101			
110		$d'=2$	13
111			

Question # 3

$$a = 16, b = 26, c = 60, d = 14$$

$$e = 23, f = 26, g = 41, h = 23$$

$$I = 6, j = 41$$

\* Initially 4 buckets required since 10 Records  
So initial hash function would be  $N \bmod 4$  (As told  
by sir)

$N=0$	00	a, c	$\bmod 4$
	01	g	$\bmod 4$
	10	b, d, f	$\bmod 4$
	11	e	$\bmod 4$

$$\text{step}^{\#1} \cdot 16 \bmod 4 = 0$$

$$(1/4 < 2 \checkmark)$$

$$\text{step}^{\#2} \cdot 26 \bmod 4 = 2$$

$$(2/4 < 2 \checkmark)$$

$$\text{step}^{\#3} \cdot 60 \bmod 4 = 0$$

$$(3/4 < 2 \checkmark)$$

$$\text{step}^{\#4} \cdot 14 \bmod 4 = 2$$

$$(4/4 < 2 \checkmark)$$

$$\text{step}^{\#5} \cdot 23 \bmod 4 = 3$$

$$(5/4 < 2 \checkmark)$$

$$\text{step}^{\#6} \cdot 26 \bmod 4 = 2$$

$$(6/4 < 2 \checkmark)$$

$$\text{step}^{\#7} \cdot 41 \bmod 4 = 1$$

$$(7/4 < 2 \checkmark)$$



Date: \_\_\_\_\_

Title: \_\_\_\_\_

Q3 continued - - - -

Step # 8

$$23 \bmod 4 = 3$$

$$\frac{8}{4} = 2$$

Split Required

not less than 2!

n=0

00	a, c	mod 4
01	g	mod 4
10	b, d, f	mod 4
11	e, h	mod 4

$$h(x) = N \bmod 4$$

$$h_{i+1}(K) = N \bmod 8$$



n=1	000	a, .	mod 8
	001	g	mod 4
	010	b, d, f	mod 4
	011	e, h	mod 4
	100	c	mod 8

$$\left( \frac{8}{5} < 2 \checkmark \right)$$

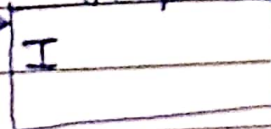
Step # 9

$$6 \bmod 4 = 2$$

$$\left( \frac{2}{5} < 2 \checkmark \right)$$

n=1	000	a	mod 8
	001	g, j	mod 4
	010	b, d, f	mod 4
	011	e, h	mod 4
	100	c	mod 8

overflow

Step # 10

$$41 \bmod 4 = 1$$

$$\left( \frac{3}{5} < 2 \checkmark \right)$$

r added here