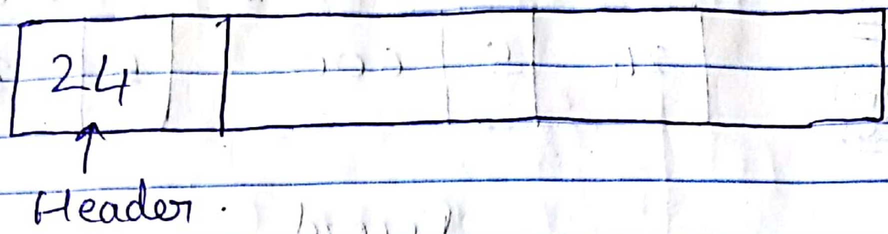
PROBLEM SET - 3 :→

1. a)



a) Total block size = 1024 − 24
= 1000 bytes.

Record size with offset = 50 + 4
= 54

$$\left\lfloor \frac{1000}{54} \right\rfloor = 18 \text{ Ans}$$

b) Total block size = 1024 − 24
= 1000 bytes

Total offset size per record = 4 × 20
= 80

$$\therefore = \left\lfloor \frac{1000 - 80}{20} \right\rfloor$$
$$= 46 \text{ Ans}$$

c) Now in this case as the record size is fixed so, there is no offset per record.

∴ Total block size (without header)
= 1024 − 24 → 1000

$$\therefore \left\lfloor \frac{1000}{50} \right\rfloor = 20 \text{ Ans}$$

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d.)

(e)

Header		Record 1		Record 2a.
24	5	600	5	390

BLOCK-2

		Record 2b.			Remaining
24	5	210	5	600	180

2

(i)

```
SELECT r.rating, r.comment,
FROM Product p, Reviewer rr, Review r;
WHERE p.pname = 'ABC AND
      rr.city = `Chicago AND
      p.pid = r.pid AND
      rr.rid = r.rid

ORDER BY r.rating DESC.
```

(ii)

```
SELECT rr.city, COUNT(rr.rid)
FROM Reviewer rr
GROUP BY rr.city
ORDER BY rr.city.
```

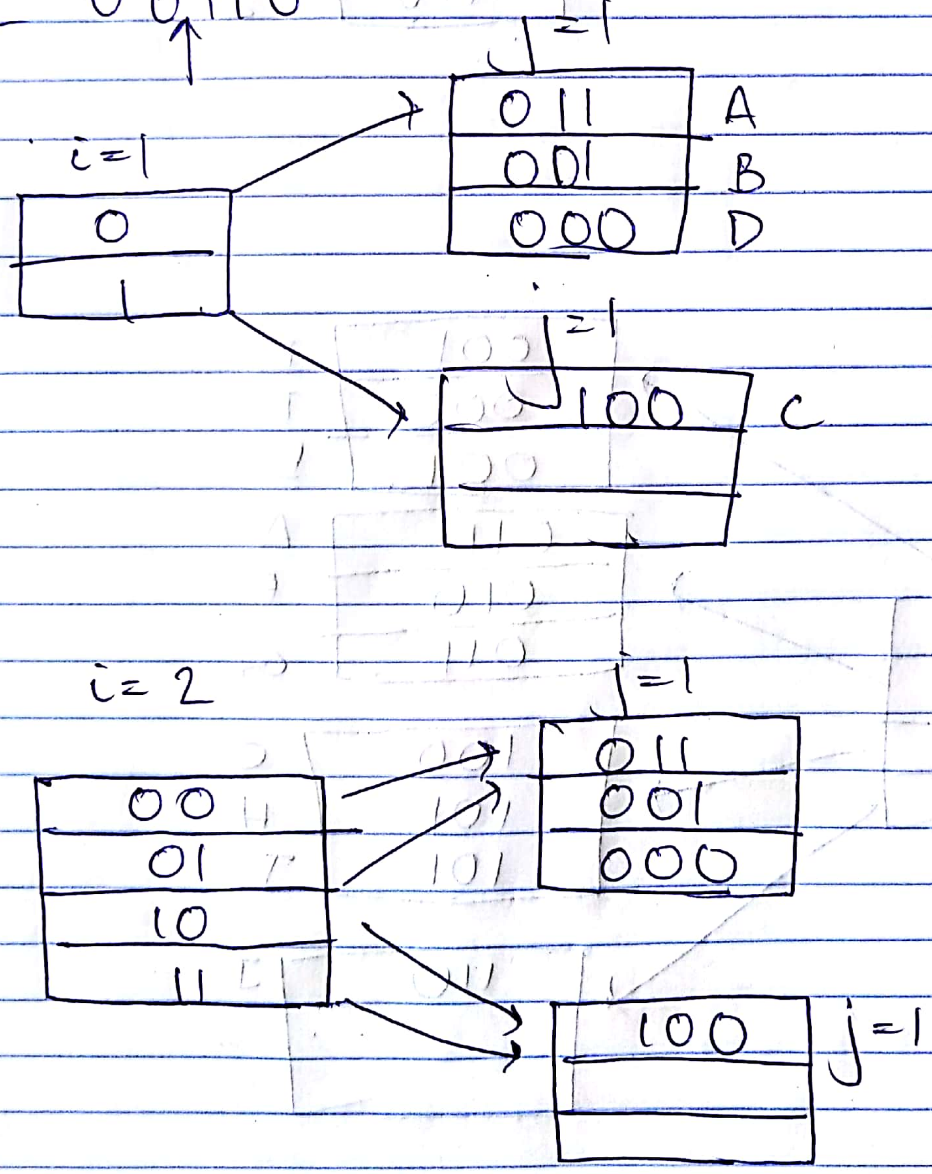
(iii) SELECT rr.rname
FROM Reviewer rr, Review r
WHERE rr.rid = r.rid
GROUP BY r.rid, rr.rid, rr.rname.
HAVING AVG(r.rating) <= 2.

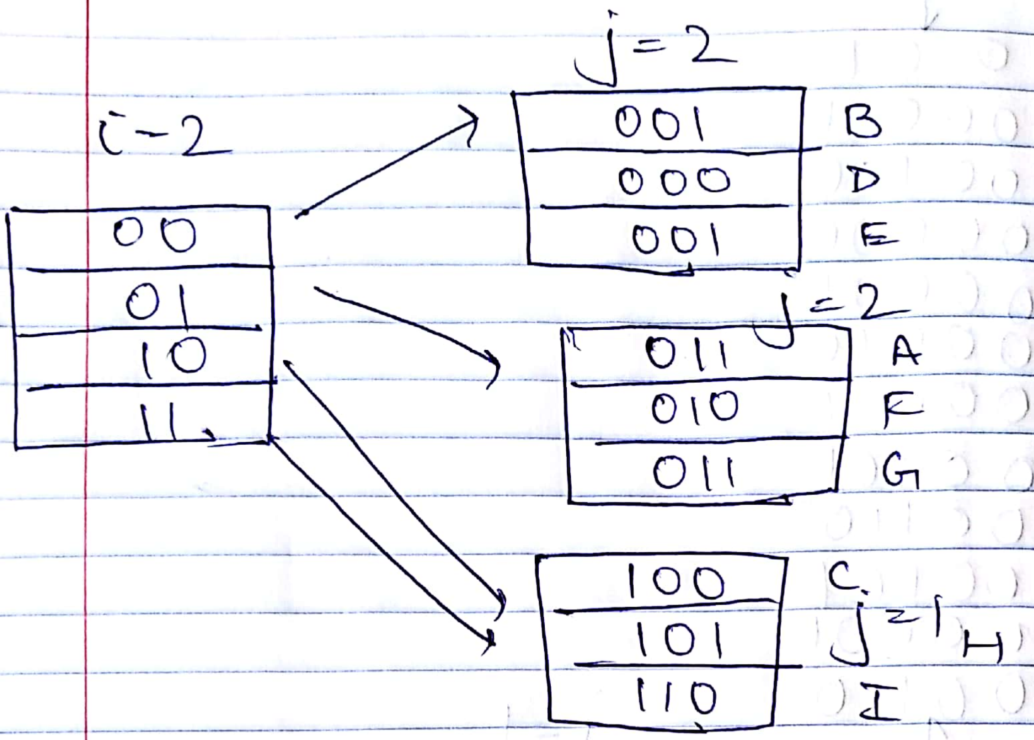
(iv) SELECT p.pname, p.description
FROM Product p, Review r
WHERE p.pid = r.pid
GROUP BY p.pid, p.pname, p.description
HAVING MIN(r.rating) >= 4.

(3)

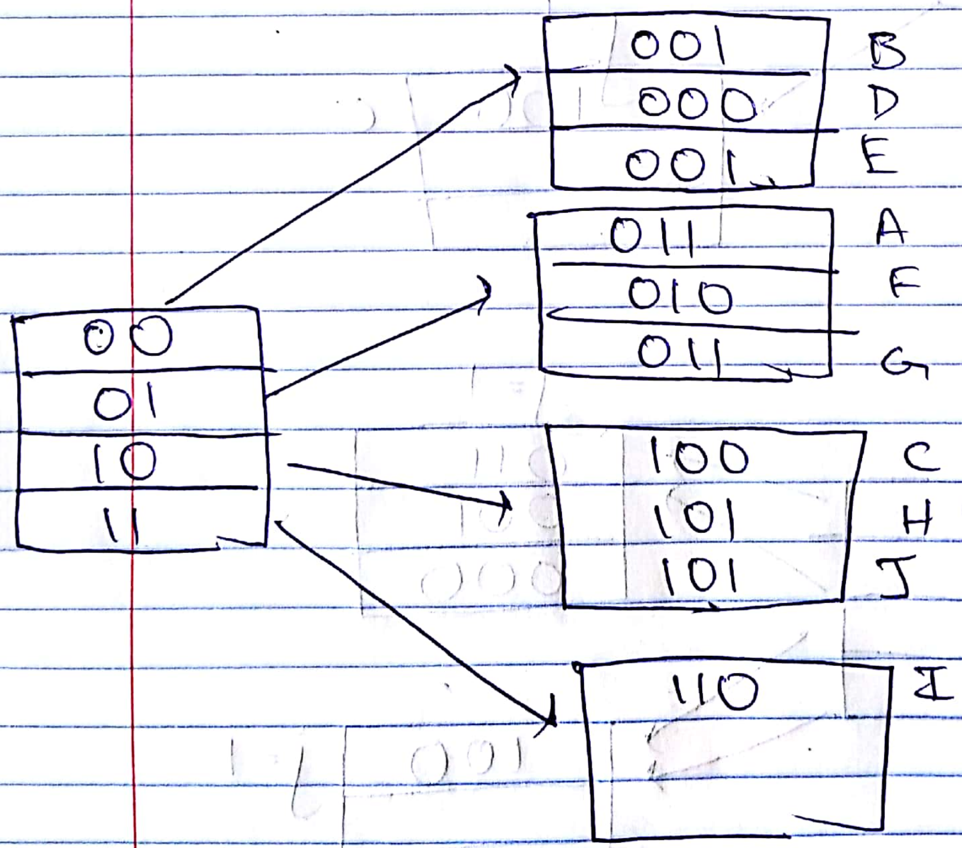
3

A	00011
B	00001
C	00100
D	00000
E	00001
F	00010
G	00011
H	00101
I	00110
J	00101
K	00001
L	00110

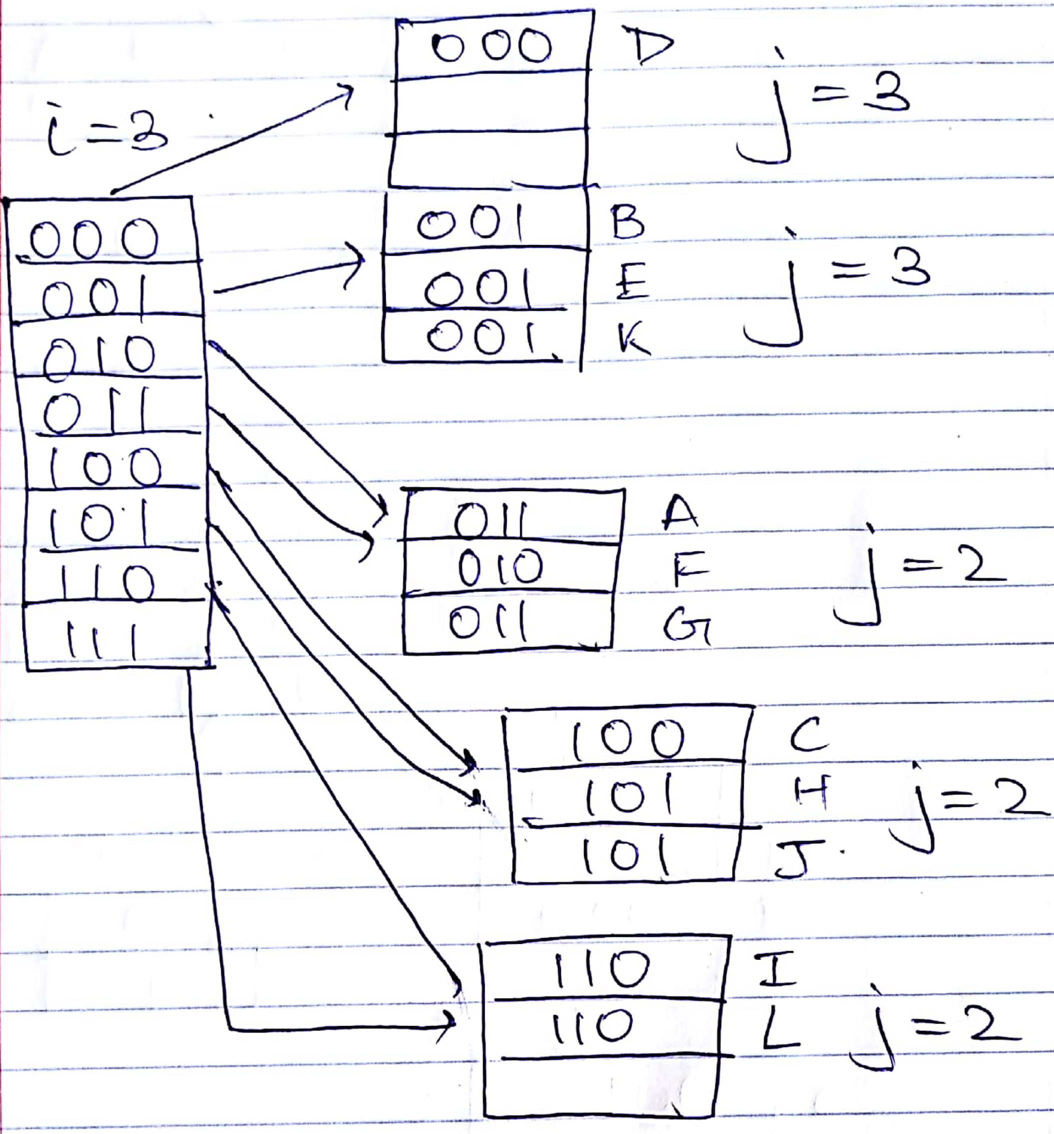




i=2
00
01
10
11
j=2
001 B
000 D
001 E
j=2
011 A
010 F
011 G
100 C
j=1
101 H
110 I



00
01
10
11
001 B
000 D
001 E
011 A
010 F
011 G
100 C
101 H
101 J
110 I


i=3
000
001
010
011
100
101
110
111
000 D
j=3
001 B
001 E
001 K
j=3
011 A
010 F
011 G
j=2
100 C
101 H
101 J
j=2
110 I
110 L
j=2

④ 4.1 → Minimum possible value of X

= 3

4.2 → Max Value

= 4 × 2

= 8

⑤ a.) Total block size = 1024 − 32

= 992 bytes.

1 record length = 12 + 5 + 6 + 7

= 30 bytes

∴ No. of records = $\left\lfloor \frac{992}{30} \right\rfloor$

= 33 records / block

b.) (i) CHECK :→

Record size = 23 × 32

= 736 bytes.

2 bytes per records = 32 × 2

= 64 bytes

∴ 736 + 64 => 800.

∴ 1024 − 32 − 800 = 192

CHECK

(ii) $30 \times 20 \rightarrow 600$ bytes.

$10 \times 10 \rightarrow 100$ bytes.

$40 \times 2 \rightarrow 80$ bytes (Header).

$= 1024 - 32 - 600 - 100 - 80$

$= 212$ bytes.

(iii) $5 \times 11 \rightarrow 55$ bytes. CHECK

$10 \times 13 \rightarrow 130$ bytes.

$20 \times 17 \rightarrow 340$ bytes.

$35 \times 2 \rightarrow 70$ bytes.

$= 1024 - 32 - 55 - 130 - 340 - 70$

$= 397$ bytes CHECK

(iv) NO CHECK

$1024 - 32 - 4 - 992$

-2 OUT OF SPACE

⑥ (i) Projection cannot be pushed below set union :→

let $R(A,B) = \{(1,2)\}$
$S(A,B) = \{(1,3)\}$

Then pi_A (R union_S S)

$= pi\_A \{(1,2), (1,3)\}$

$= \{(1), (1)\}$

But the union → $\{(1)\}$

Since the set union removes the duplicates from the union.

(ii) Projection cannot be pushed below set or bag difference :→

$R(a,b,c) = \{(1,2,3), (1,3,2)\}$

&

$S(a,b,c) = \{(1,2,3), (1,4,5)\}$

This relation provides an example of schemas & instances.

(iii) Duplicate elimination cannot be pushed below projection:→

The relation schemas and instances
$R(a,b,c) = \{(1,2,3), (1,3,2)\}$

$S(a,b,c) = \{(1,2,3), (1,4,5)\}$

gives an example which proves the assertion.

(iv) Duplicate elimination cannot be pushed below bag union or difference :→

$R(a) = \{(1), (1)\}$
$S(a) = \{(1), (1)\}$

gives relation schemas & instances which proves the assertion.

(7) (i) $\pi_{sname}(\pi_{sid}((\pi_{pid}\sigma_{color="red"} Parts) \bowtie Catalog) \bowtie Suppliers)$

(ii) $\pi_{sid}((\pi_{pid}\sigma_{color="red" \vee color="green"} Parts) \bowtie Catalog)$

(iii) $\pi_{sid}((\pi_{pid}\sigma_{color="red"} Parts) \bowtie Catalog) \cup \pi_{sid}(\sigma_{address="10\ West\ 31st\ Street"} Suppliers)$

(iv) $\pi_{sid}((\pi_{pid}\sigma_{color="red"} Parts \cap (\pi_{pid}\sigma_{color="green"} Parts)) \bowtie Catalog)$

(v) $\pi_{R1.sid, R2.sid} (\sigma_{R1.pid = R2.pid \wedge R1.sid \neq R2.sid \wedge R1.cost > R2.cost}$

$(\rho_{R1}\ Catalog \times \rho_{R2}\ Catalog))$

(vi) $\pi_{R1.pid} (\sigma_{R1.pid = R2.pid \wedge R1.sid \neq R2.sid} (\rho_{R1}\ Catalog \times \rho_{R2}\ Catalog))$.

(vii) $t1 \leftarrow ((\pi_{sid}\ \sigma_{sname = \text{"Yosemite Sham"}}\ Suppliers) \bowtie Catalog)$

$t4 \leftarrow \pi_{t2.sid, t2.pid, t2.cost}\ \sigma_{t2.cost < t3.cost} (\rho_{t2}(t1) \times \rho_{t3}(t1))$

$\pi_{pid} (\rho_{t5}(sid, pid, cost)\ t1$

$- (\rho_{t6}(sid, pid, cost)\ t4)$

8 (i) $T(library) = 100$

$V(library, public) = 2$

$$T(a) = \frac{100}{2} \left(\frac{T(library)}{V(library, public)}\right)$$

$= \underline{50}$

(ii) $T(book) = 100{,}000$

$V(book, title) = 50{,}000$

$V(book, author) = 30{,}000$

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$$= \frac{T(book)}{V(book, title) \cdot V(book, author)}$$

$$= \frac{100{,}000}{50{,}000 \cdot 30{,}000}$$

$$= \frac{1}{15{,}000}$$

(iii) $T(q) : \rightarrow$

$$= \frac{4-2+1}{max(book, edition) - min(book, edition) + 1} \cdot \frac{1}{50{,}000} \cdot T(book)$$

$$= \frac{3 \cdot 100{,}000}{15 \cdot 50{,}000}$$

$$= \frac{2}{5} \Rightarrow 0.4$$

(iv) $V(book, title) = 50{,}000$

$T(book) = 10{,}000$

$max(library, budget) = 70$

$min(library, budget) = 10$

$T(library) = 100$

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$$T(q_1) = \left(1 - \left[\left(1 - \frac{1}{V(book, title)}\right) \cdot \left(1 - \frac{1}{V(book, title)}\right)\right]\right) \cdot T(book)$$

$$= \left(1 - \left(1 - \frac{1}{50000}\right) \cdot \left(1 - \frac{1}{50000}\right)\right) \cdot 10000$$

$$\approx 4$$

Selection result size q_2 :→

$$T(q_2) = \frac{max(library, budget) - 40 + 1}{max(library, budget) - min(library, budget) + 1} \cdot T(library)$$

$$= \frac{70 - 40 + 1}{70 - 10 + 1} \cdot 100$$

$$\approx 51$$

∴ $T(q)$:→

$$\frac{T(q_1) \cdot T(catalog) \cdot T(q_2)}{max(Value1) \cdot max(Value2)}$$

$$= \frac{4 \cdot 100 \cdot 51}{\max(2, 90000) \cdot \max(100, 51)}$$

$$= \frac{20,400}{90,000,000}$$

$$\approx \frac{2}{900}$$