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Operating Systems.

Final Exam

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18K-0179

Section - 4B

Letter Grade.

Q1

① Drawbacks of many-to-one thread model:

⇒ In this model a thread blocking system call would block the entire process of the running thread. Because we have one one kernel level thread available.

⇒ Multiple threads of a process are not able to access the kernel at the same time ie no parallism on threads.

② Micro kernel	Monolithic.
⇒ Provides low level address space management, IPC to implement the Os and thread management.	⇒ Os works in the kernel space and direct access of hardware.
⇒ Os and kernel are seperated.	⇒ Kernel contains the Os services
⇒ It's slow	⇒ It's fast
⇒ If one component fails other will run	⇒ If one component fails the entire system will be affected.

→ New features can be added easily.	→ It's difficult to add new features.
→ Quite small	→ Quite large

(iii) When a lower priority process holds a lock needed by a high-priority process this problem can be solved by Priority Inheritance protocol, In this process, the lower-priority process executes it's critical section at an elevated priority level, after execution of that process it's priority returns to it's original state.

(iv) User level Thread.

Thread is a light weight process uses. Less resources compared to the process.

PROs

→ Thread switching does not involve OS.
→ It consumes less resources
→ All threads share the data of the process
→ If one thread is blocked other can run.

Cons.

→ Lack of co-ordination b/w threads and OS. kernel.
→ Process gets only time slice irrespective of the of threads.
→ Require non-blocking system call.

. Kernel Level threads.

Threads managed by kernel.

Pros.

→ scheduler decides to give more time to a process having large number of threads.
. Good for applications that frequently blocks.

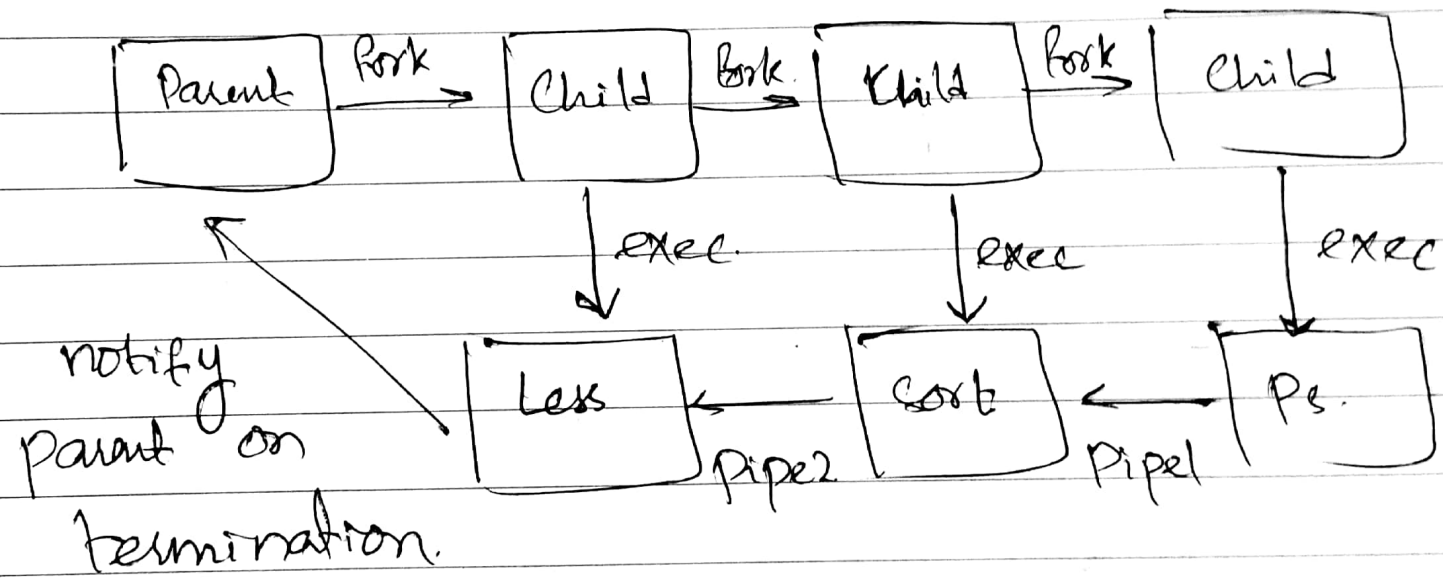
Cons

→ Slow and inefficient
→ Due to extensive sharing among kernel level threads, there is an issue of security.

(v)

Data Parallelism	Task Parallelism
→ Same operations are performed on different subsets of same data	→ Different operations are performed on the same or different data.
→ Synchronous	→ Asynchronous.
→ Speedup is more as there is only one execution thread operating on all sets of data.	→ Speedup is less as each processor will be busy with a different thread.
→ Parallelization is proportional to the input data size	→ Parallelization is proportional to the number of independent tasks.

Q2 ps|sort|less.



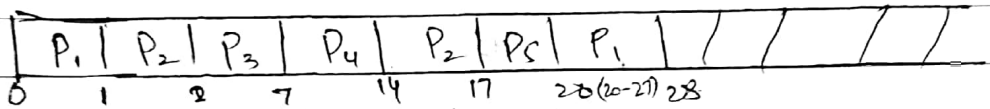
Q3 Semophore = ~~bool~~ lock = 1.

```
Enter-Bridge(){.
    wait(lock);
        // cross bridge
}
Exit-Bridge(){.
    signal(lock);
}
```

This pseudo code implimentation can prevent deadlock caused by vermont-farmers.

Q4 1)

Process	AT	BT	Priority	W.T	C.T	T.AT
P_1	0	8	5	19-0=19	27	27
P_2	1	4	3	13-1=12	16	15
P_3	2	2	1	1-2=0	6	4
P_4	3	7	2	6-3=3	13	10
P_5	4	3	4	16-4=12	19	15
				Avg: 9.2		Avg: 14.2

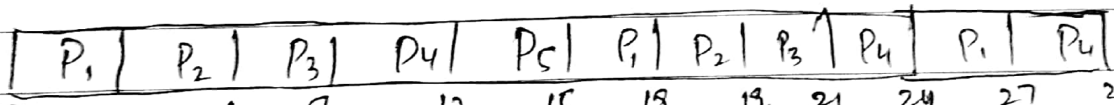


(0-0) (1-1) (2-6) (7-13) (14-16) (17-19)

2)

TQ=3

Process	AT	BT	W.T	C.T	TAT
P_1	0	8	23-0=23	26	26
P_2	1	4	17-1=16	18	17
P_3	2	2	18-2=16	20	18
P_4	3	7	24-3=23	27	24
P_5	4	3	11-4=7	14	16
			Avg=17		Avg=19



(0-2) (3-5) (6-8) (9-11) (12-14) (15-17) (18-18) (19-20) (21-23) (24-26) (27-27)

iii). SRTF

Process	A.T	B.T	W.T	C.T	TAT.
P_1	0	~~8~~ 10	19-0=19	27	~~27~~
P_2	1	~~4~~ 0	0-1=0	4	3
P_3	2	~~8~~ 0	7-2=5	12	10
P_4	3	7 0	~~20~~ 3=~~9~~	~~19~~	~~18~~
P_5	4	~~3~~ 0	4-4=0	7	3

Avg = 6.6.

Avg = ~~12~~ . 8

P_1	P_2	P_5	P_3	P_4	$P_{\cancel{4}}$

0 1 5 8 13 20 28

(0-0) (1-4) (5-7) (8-12) (13-~~19~~) (21-27).

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Qs

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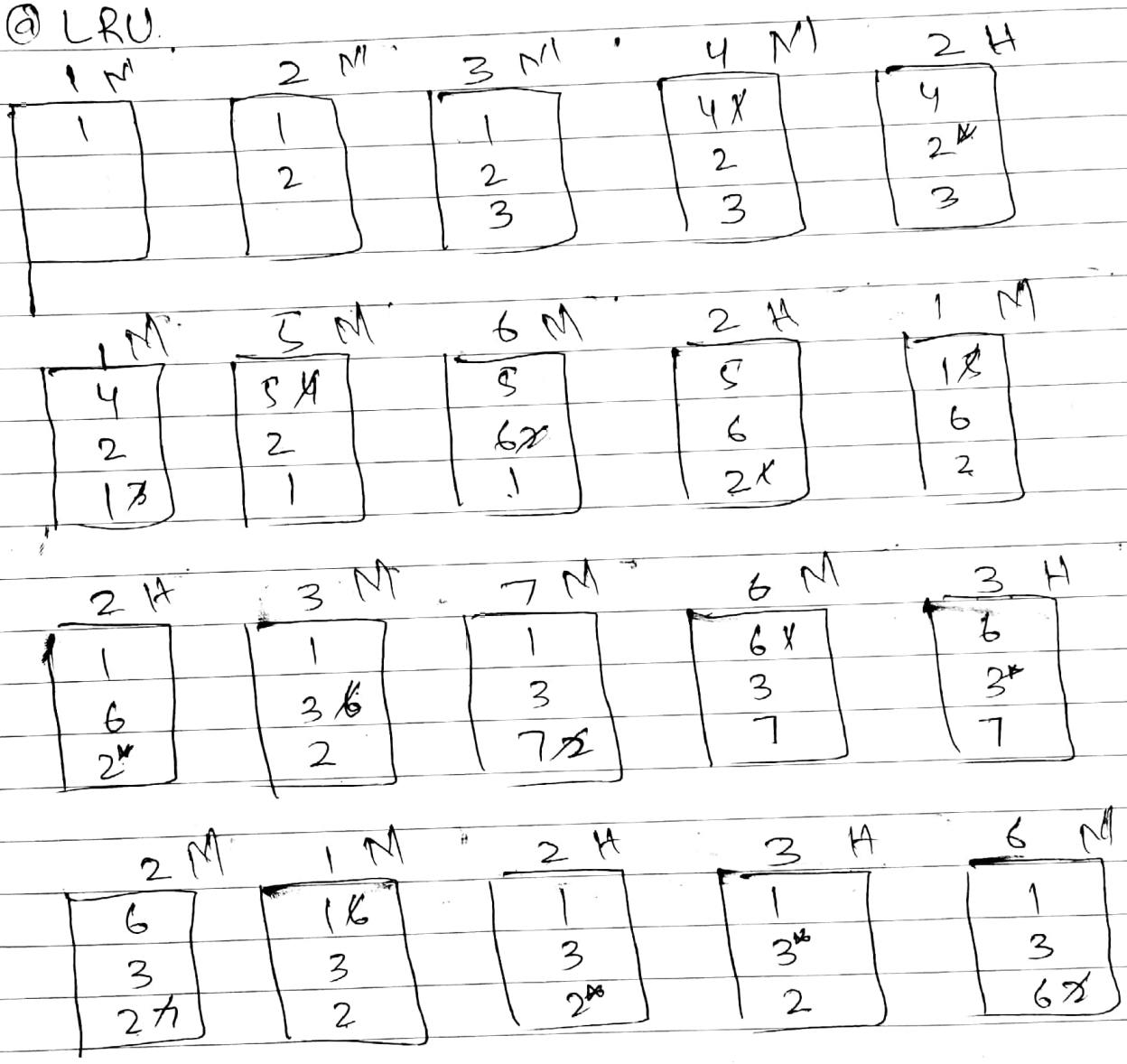

Page Hits = 5

Page faults = 15

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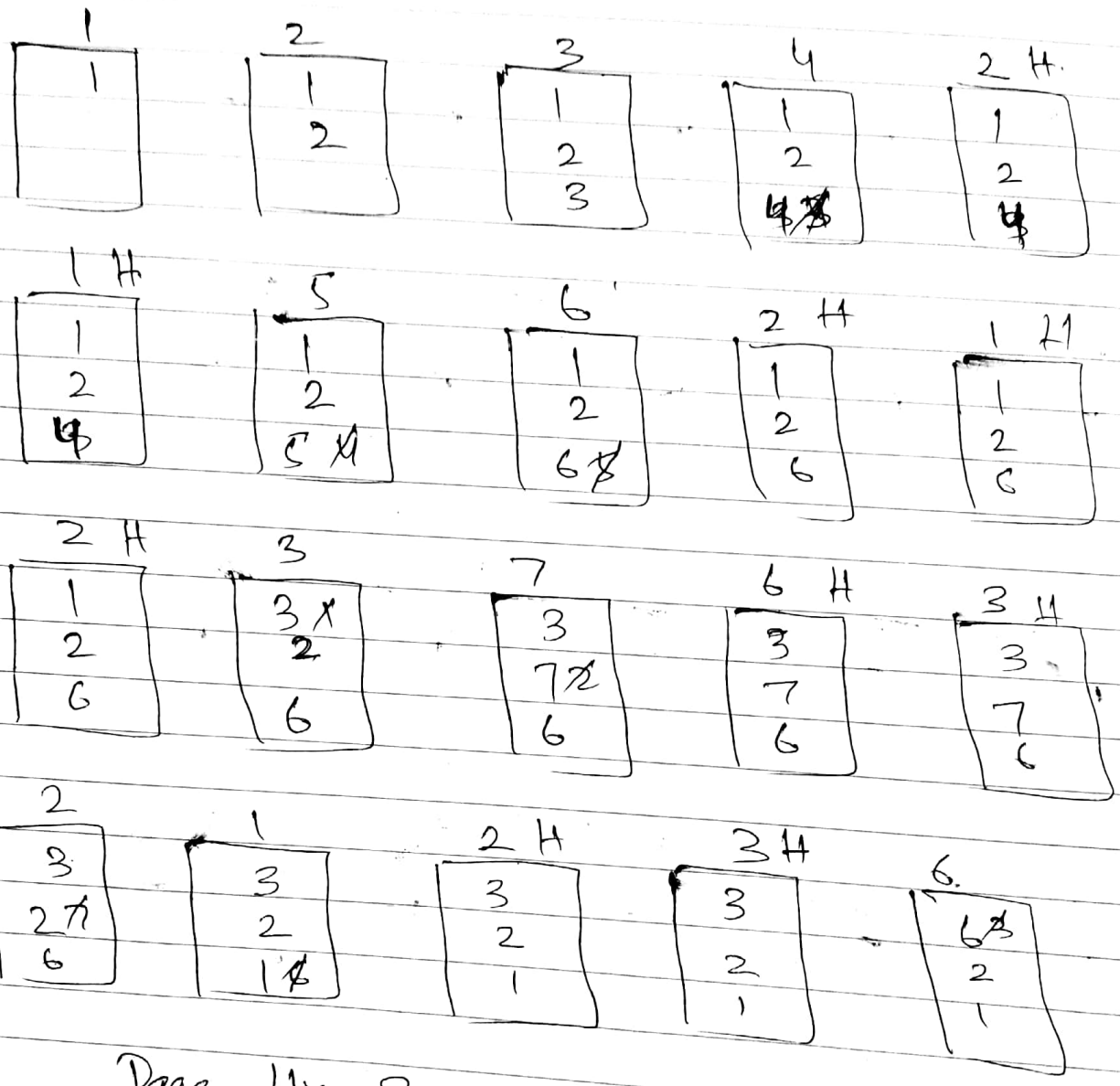
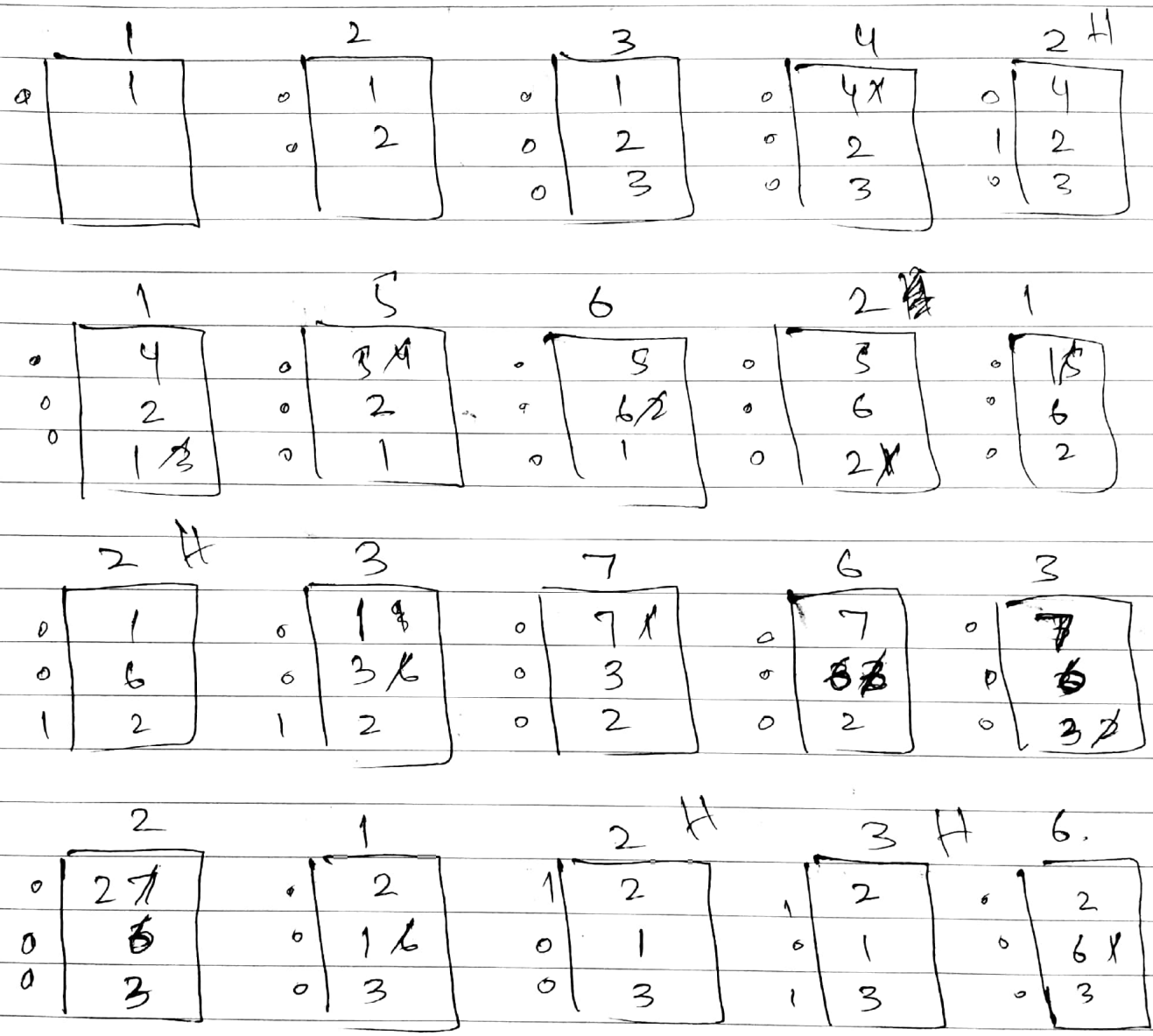
(b) Optimal



Page His = 9

Page faults = 11.

c) Second Chance



Page hits. = 4

Page faults = 16

Q6

Address.	Page size.	P	d (offset)
3085	4096	0	3085
42095	4096	10	1135
215201	4096	52	2209
650000	4096	158	2832
2000001	4096	488	1153
	~~4096~~		

Q7

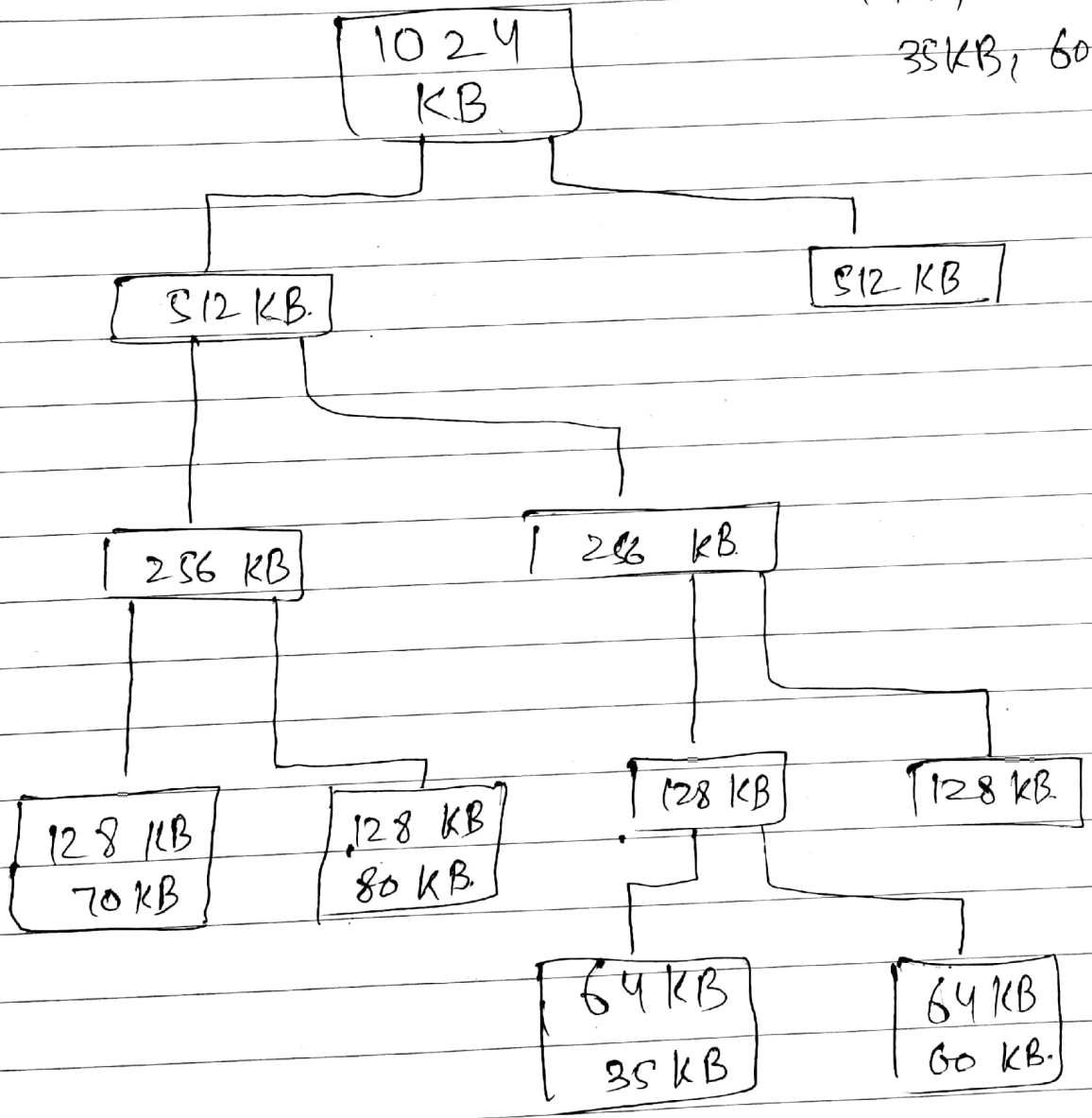
Logical Address Space = 32 Bits.
Page size = 4KB = $2^2 \cdot 2^{10} = 2^{12}$
Physical Address Space = 512 MB = $2^9 \cdot 2^{20} = 2^{29}$ Bits

Logical Address bits: $\frac{2^{32}}{2^{12}} = 2^{20}$ Bits.

Physical Address bits = $\frac{2^{29}}{2^{12}} = 2^{17}$ Bits.

Q8 1 MB = 1024 KB.

70KB, 80KB
35KB, 60KB



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Q9

Access time = 40ns
Hit rate = 90% = 0.9.
Fail rate = 0.1
Search time = 10ns.
EAT = ?

$$EAT = (0.9)(40+10) + (0.1 * (40+40+10))$$

$$EAT = 45 + 9$$
$$EAT = 54.$$

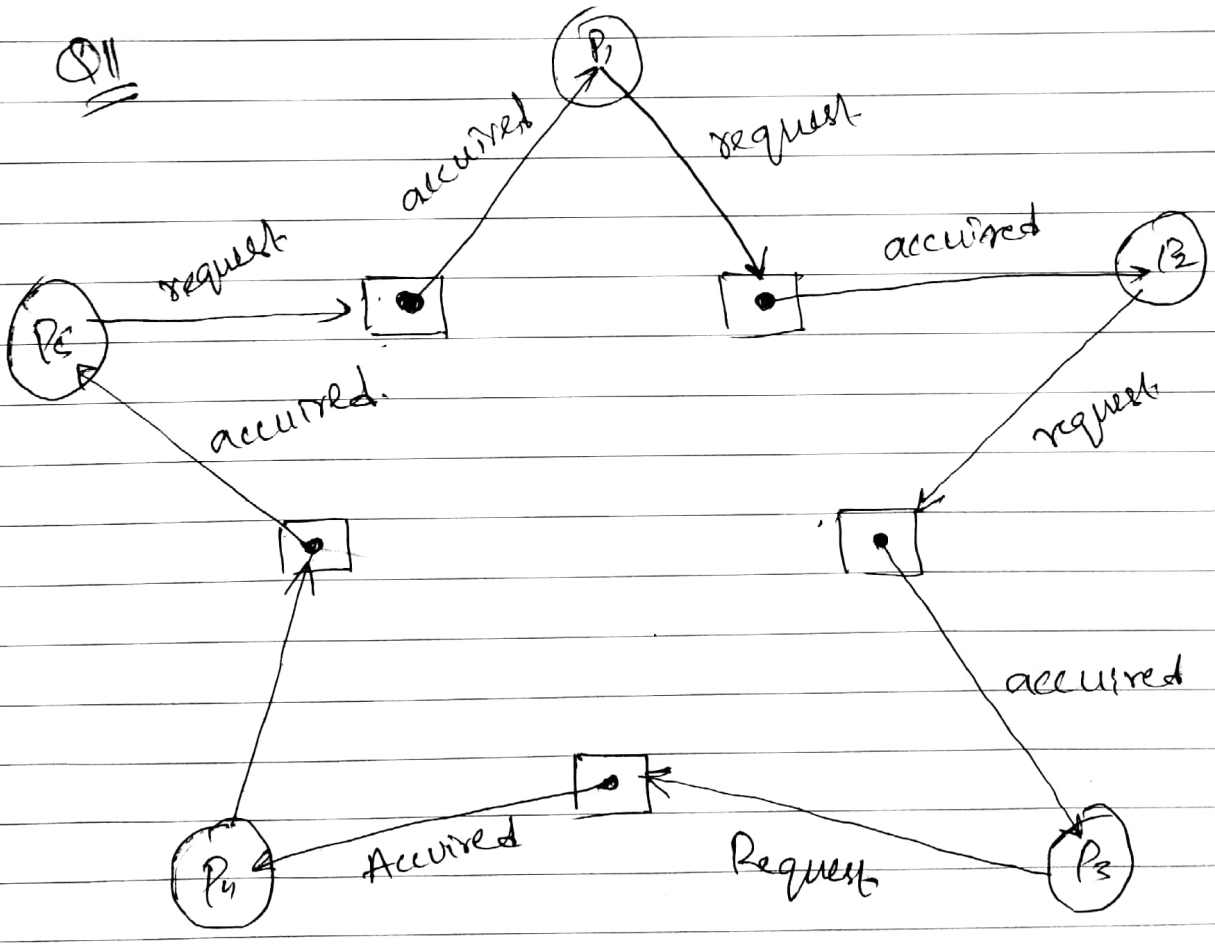
Q10

Process	Allocated	Maximum	Needed	Available
	A B C D	A B C D	A B C D	A B C D
P_0	2 0 2 1	9 5 5 5	7 5 3 4	6 3 5 4
P_1	0 1 1 1	2 2 3 3	2 1 2 2	
P_2	4 1 0 2	7 5 4 4	3 4 4 2	
P_3	1 0 0 1	3 3 3 2	2 3 3 1	
P_4	1 1 0 0	5 2 2 1	4 1 2 1	
P_5	1 0 1 1	4 4 4 4	3 4 3 3	

(4) P_0 - Need > work
(6) P_1 - Need < work, Available: [6 4 6 5]
(5) P_2 - Need < work, Available: [10 5 6 7]
(0) P_3 - Need < work, Available: [11 5 6 8]
(5) P_4 - Need < work, Available: [12 6 6 8]
(6) P_5 - Need < work, Available: [13 6 7 9]
(7) P_0 - Need < work, Available: [15 6 8 10].

Safe seq: {1, 2, 3, 4, 5, 0}.

Q11



Deadlock.