

Q1. 2101738

using the multiple instance of each resource type  
Available at time t:  $[0, 0, 1]$  deadlock detection algorithm:

P3 is not deadlocked at the moment. Pretend to run completion. Available becomes  $[1, 2, 1]$

Then P4 can be satisfied. Pretend to run completion. Available becomes  $[2, 2, 2]$

Then P5. Available becomes:  $[3, 3, 5]$

Then P1. Available becomes:  $[4, 3, 5]$

Then P2. Available becomes:  $[5, 3, 5]$

Sequence  $\langle P_3, P_4, P_5, P_1, P_2 \rangle$  will result  $Finish[i] = \text{true}$

For all  $i \rightarrow \text{NO DEADLOCK}$

Q2. using the Banker's Algorithm:

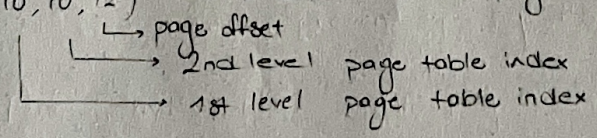
0

Need = MaxDemand - Alloc				Available Initially:
	A	B	C	$[1, 0, 2]$
P1	4	1	2	P4. pretend to run completion Available = $[2, 2, 3]$ Then P2 Available = $[3, 3, 4]$ Then P5 Available = $[5, 3, 5]$ Then P1 Available = $[6, 3, 8]$
P2	0	1	0	
P3	1	4	2	
P4	1	0	2	
P5	1	3	0	

P3 can never run. So, state is not safe.

Q3. Page size =  $2^{12}$  = 4096 bytes = 4KB

$\Rightarrow (10, 10, 12) \rightarrow 4$  bytes (each page table entry)



$2^{10}$  = 1024 entries per each page table

$\frac{8 \times 1024 \text{ KB}}{4 \text{ KB}}$  = 2048 pages

$\rightarrow \frac{2048}{1024} = 2$  second-level

Memory required for 1st level PT:  $1024 \times 4 \text{ byte} = 4 \text{ KB}$

" " " 2nd " "  $2 \times 1024 \times 4 = 8192 = 8 \text{ KB}$

12KB



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$$a - 0xA30D = \underbrace{1010}_{\text{page \# = 10 in decimal}} \overbrace{0011\ 0000\ 1101}^{\text{offset} = 0 \times 30D}$$

↓  
value = 3

Physical address =  $0 \times 0330D$

$$b - 0x5023 = \underbrace{0101}_5 \overbrace{0000\ 0010\ 0011}^{0 \times 023}$$

5 → value = 17

P.A =  $0 \times 11023$

$$c - 0x8a1f = \underbrace{1000\ 1010}_8 \ 0001\ 1110$$

8 → value = 95

PA =  $0 \times 5FA1F$

$$d - 0x301e$$

↳ value = DNE!

INVALID ADDRESS!