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OS HW 5

Problem 5.1

$$1 \quad M = \begin{bmatrix} 3 & 5 & 8 & 10 & 1 \\ 2 & 5 & 3 & 3 & 2 \\ 4 & 12 & 4 & 9 & 2 \\ 6 & 1 & 4 & 5 & 5 \end{bmatrix} \quad A = \begin{bmatrix} 0 & 2 & 1 & 1 & 1 \\ 0 & 5 & 3 & 1 & 1 \\ 0 & 7 & 1 & 2 & 1 \\ 3 & 1 & 1 & 1 & 0 \end{bmatrix}$$

$$t = (3, 15, 6, 5, 3)$$

Initially we have  $t = (6, 15, 8, 10, 9)$

But after allocating ~~some~~ we have  
 $t = (6-3, 15-15, 8-6, 10-5, 9-3)$

$$t = (3, 0, 2, 5, 6)$$

$$N = M - A$$

$$= \begin{bmatrix} 3 & 3 & 7 & 9 & 0 \\ 2 & 0 & 0 & 2 & 1 \\ 4 & 5 & 3 & 7 & 1 \\ 3 & 0 & 3 & 4 & 5 \end{bmatrix}$$



Initially Process 2 will go

$$t = (3, 0, 2, 5, 6) \quad R = \{2\}$$

Now after 2 finishes

$$t = \{3, 5, 5, 6, 7\} \quad R = \{4\}$$

Now Process 4 will go and after termination

$$t = (6, 6, 6, 7, 7) \quad R = \{3\}$$

Now Process 3 will go and be used

$$t = (6, 13, 7, 9, 8) \quad R = \{1\}$$

Now process 1 will go and 1 terminates.  
This is the end and we have

$$t = (6, 15, 8, 10, 9) \quad \text{will be left.}$$

$\therefore$  This system is safe as all processes are able to use the resource and run.

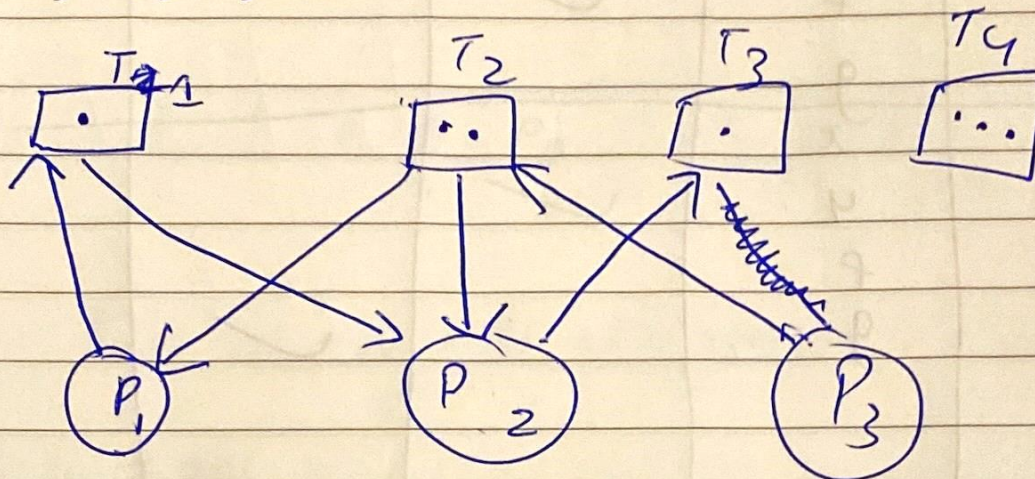


## Problem 5.2

$$A = \begin{bmatrix} 6 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$N = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

$$t = (1, 2, 1, 0)$$



∴ Initially we have  $t = (1, 2, 1, 3)$

But after giving  $t = (1, 2, 1, 0)$

we are left with  $(0, 0, 0, 3)$

no process can take this therefore  
we are in a deadlock situation.



# Problem 5.9

g)	file	Symbol	internal	external	Weak	Strong
	a.c	x		✓	✓	
	a.c	y	✓			✓
	a.c	f				✓
	a.c	g				✓
	b.c	x	✓			✓
	b.c	y				✓
	b.c	f		✓		
	b.c	g				
* Confused with a.c g, b.c x and b.c f.						

b)

b.c: f()

a.c: g()

a.c: f()

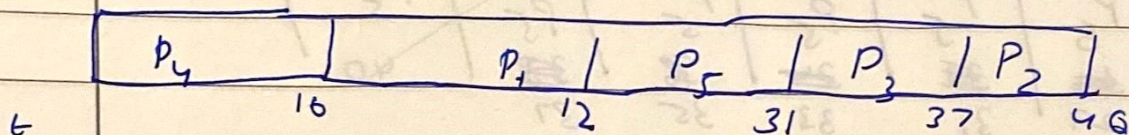
Initially there are two f() functions but as one of them is static it will go to the b.c f(). From there go to a.c g() as it is external and from there into



the same f() within a.c().

### Problem 5.3

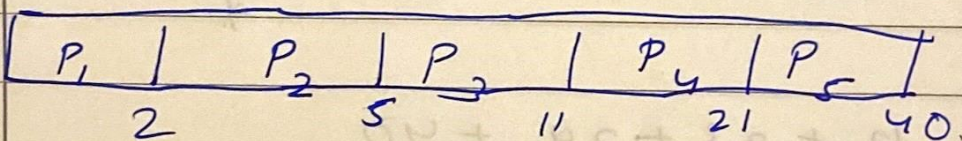
First come First serve.



$$\bar{e} = \frac{10 + 12 + 31 + 37 + 40}{5}$$

$$= 26$$

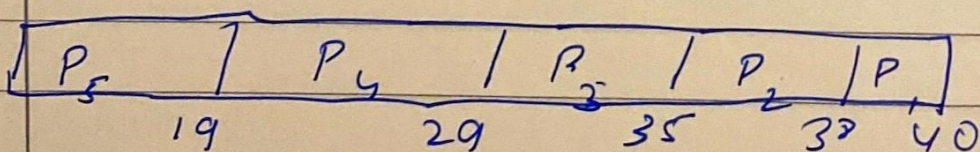
### Shortest Job First



$$\bar{e} = \frac{2 + 5 + 11 + 21 + 40}{5}$$

$$= 15.8$$

### Longest Processing time



$$\bar{e} = \frac{19 + 29 + 35 + 37 + 40}{5} = 32.2$$



# Round Robin

left to do

8	0	17	4	1	6	15	2	0	4	13	0	2	11	0	9	7	5	3	14	0
$P_4$	$P_1$	$P_5$	$P_3$	$P_2$	$P_4$	$P_5$	$P_3$	$P_2$	$P_4$	$P_5$	$P_3$	$P_4$	$P_5$	$P_4$	$P_5$	$P_5$	$P_5$	$P_5$	$P_5$	$P_5$
2	4	6	8	10	12	14	16	17	19	21	23	25	27	<del>29</del>	<del>31</del>	<del>33</del>	<del>35</del>	<del>37</del>	<del>39</del>	<del>40</del>
*							*			*				29	31	33	35	37	39	40
														*						*

$$\bar{e} = \underline{4 + 17 + 23 + 29 + 40}$$

$$= 22.6$$