

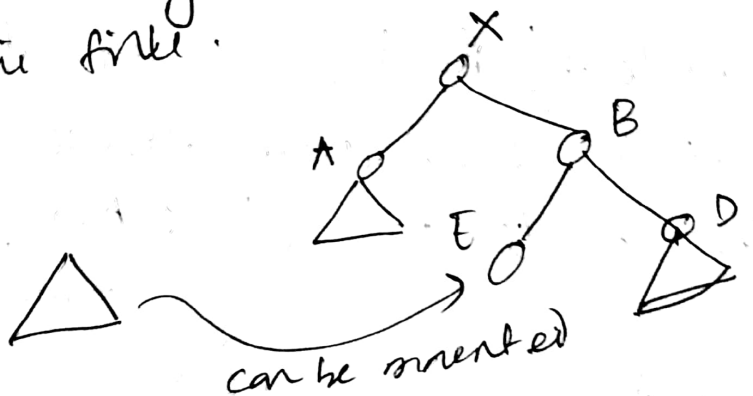
Solution

1. (a) ϵ_0 bounded process and CPU bound process defⁿ. - 2 marks.

(b) Continually denied access with the resource. - 1 mark.

- 1) priority allocⁿ: aging technique
- 2) badhu process: queue. - 1 mark

(c) mounting a file system under a directory such that process can access the file.



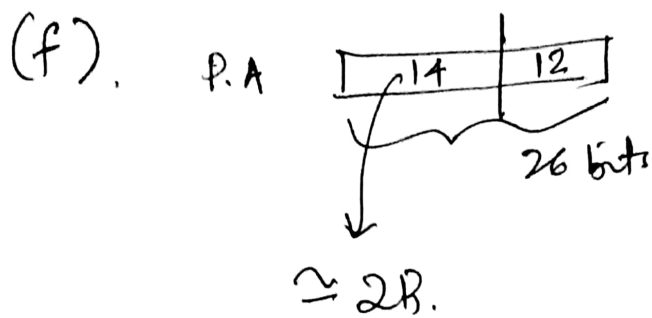
- 2 marks.

(d) [C]: Scheduler process. - 2 marks.

(e) 6000 rev occurs in 60 sec
 $\frac{1}{2}$ rev " in $\frac{60}{6000} \times \frac{1}{2}$ sec = 5 ms.

data transfer time = $t_s + t_L + t_d$
 $= 10 + 5 + 0 = 15 \text{ ms}$

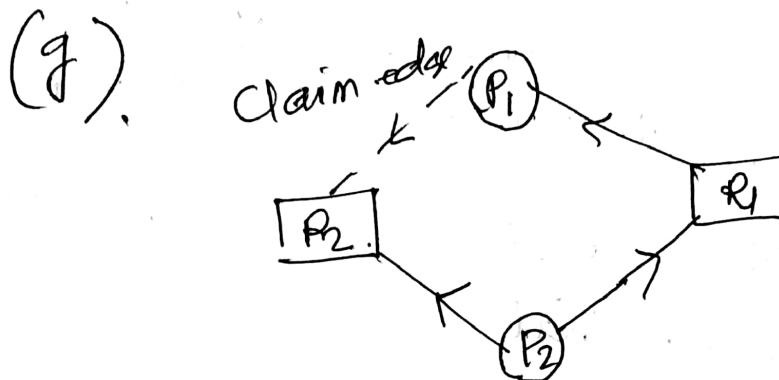
data transfer for 100 kbit = $100 \times 15 \text{ ms} = 1500 \text{ ms}$
 $= 1.5 \text{ sec.}$ - 2 marks ①



Size of page table = $2^{20} \times 2B.$

$= 2MB.$

- 2 marks.



Don't allocate R_2 to P_2 as in future it may lead to dead state. Avoid forming a cycle in the RAG.

- 2 marks.

(h) starvation: to avoid use aging

- 2 marks.

(i) yes, as a small space may be available @ free in the main mem and is not sufficient to fit any of the segment.

- 2 marks.

(j) child process = 7.

- 1 mark.

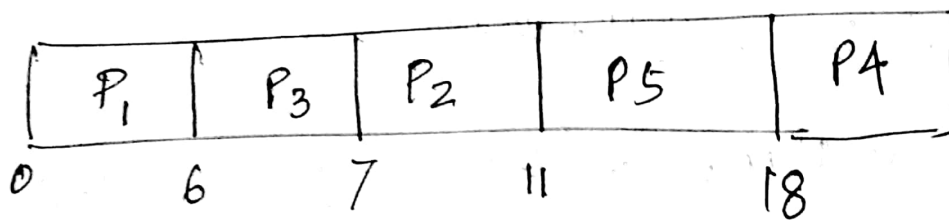
Explanation

- 1 mark. ②

2)

Non pre-emptive SJF

Process	at.	bt.	wt.	ex. time
P1	0	6	0	$6 + 1 + 4 + 7 + 9$ $= 27$
P2	1	4	6	
P3	2	1	4	
P4	3	9	15	
P5	4	7	7	



$$\text{av. waiting time} = \frac{32}{5} = 6.4$$

$$\text{av. t.a. time} = \frac{32 + 27}{5} = \frac{59}{5} = 11.8 \approx 12$$

$$\text{av. resp. time} = \text{av. wt. time} = 6.4$$

- 4 marks

wait & Rx

—

1

$$\text{av. t. a tin} = \frac{28 + 27}{5} = \frac{55}{5} = 11.0.$$

- 4 manly.

- 4 marks.

3) (a) - Definition of semaphore

- 1 mark.

- wait & signal operation

EXPLANATION with/without busy waiting

- 2 marks.

- Reader writer problem & ~~semaphore~~
solution

- 1 mark.

(b) 1st reader writer problem explanation
solution

- 1 mark

- 3 marks.

1) a) global
 roman

	f1	f2	f3	f4	Pont1	Pont2	d1	d2	d3
d1	r	-	-	rxw	-	-	-	switch	-
d2	-	rx	-	-	port	-	-	-	-
d3	rxw	r	-	-	port	port	switch	-	-
d4	-	-	rxw	r	-	-	-	-	-

-2 marks

1) access matrix global.

2) capability list (row wise)

3) columnwise list.

- 2 marks.

(4) (b)

<u>LRV</u>	7	0	1	2	0	3	0	4	2	3	0	3	2	1	3	2	1	2	3	6
	f	f	f	f	h	f	h	f	h	h	h	h	h	f	h	h	h	h	h	f
						0		0						0						1
						1		2						1						2
						2		3						2						3
						3		4						3						6

no. of fault = 8.

- 2 marks

optimal

7	0	1	2	0	3	0	4	2	3	0	3	2	1	3	2	1	2	3	6
f	f	f	f	h	f	h	h	h	h	h	h	f	h	h	h	h	h	h	f
						3								1					6
						0								3					3
						4								2					2
						2								4					4

no. of fault = 7.

⑥(1)

AN Sch
Head

<u>SSTP</u>	<u>req. trace #</u>	<u>no of trace ment.</u>
	130	13
	86	44
	913	827
	948	35
	1022	74
	1470	448
	1509	39
	1750	241
	1774	24

Total: 1745 lars ~~1745~~ - 2manus

SCAN

<u>req. trace #</u>	<u>no. of trace ment.</u>
913	800 770
948	35
1022	74
1470	448
1509	39
1750	241
1774	24
130	1644
86	44

Total trace = 3319
ment.

~~1745~~ =

Am

SCAN Scheduling

Head movement: $913 \rightarrow 948 \rightarrow 1022 \rightarrow 1470 \rightarrow 1509 \rightarrow 1750$
 $\rightarrow 1774 \rightarrow 4999 \rightarrow 130 \rightarrow 86$

$$\begin{aligned} &= (913 - 143) + (948 - 913) + (1022 - 948) + (1470 - 1022) \\ &\quad + (1509 - 1470) + (1750 - 1509) + (1774 - 1750) + \\ &\quad + (4999 - 1774) + (4999 - 130) + (130 - 86) \end{aligned}$$

$$\begin{aligned} &= 770 + 35 + 74 + 448 + 39 + 241 + 24 + 3225 \\ &\quad + 4869 + 44 \\ &= 9769 \end{aligned}$$

- 2 marks.

(5)(b) ~~difference~~ Explanation of short term, medium term & long term scheduling

- 2 marks.

Description of differences

- 2 marks.

6 (a)

	<u>alloc^N</u>	<u>Max need</u>	<u>avalays</u>
	a b c d	a b c d	a b c d
P ₀	2 0 0 1	4 2 1 2	3 3 2 1
P ₁	3 1 2 1	5 2 5 2	5 3 2 2
P ₂	2 1 0 3	2 3 1 6	7 4 2 6
P ₃	1 3 1 2	1 4 2 4	8 7 3 8
P ₄	1 4 3 2	3 6 6 5	9 6 10
			12 12 8 11

1) P₀ ~~P₂~~ P₃ P₄ P₁ P₂ is a safe sequence
 so the state is safe.

- 2 trans.

9

ii)

	alloc ⁿ	max	available
	a b c d	a b c d	a b c d
P ₀	3 1 0 1	4 2 1 2	2 2 2 1
P ₁	3 1 2 1	5 2 5 2	5 3 2 2
P ₂	2 1 0 3	2 3 1 6	6 6 3 4
P ₃	1 3 1 2	1 4 2 4	7 10 6 6
P ₄	1 4 3 2	3 6 6 5	10 11 8 7
			12 12 8 10

am edge? How it is back of p

~~Safe sequence:~~

~~P₀, As P₀ is satisfied~~

safe sequence: P₀, P₃, P₄, P₁, P₂

As there exist a safe sequence, the request will be granted.

→ 2 marks

⑥(b) Explanation about various directory structures

like single level

2-level

tree

graph

Ayclic graph

→ 2 marks

Relative advantages & disadvantages

→ 2 marks

7(a) Explanation of Paging technique - 1 mark.

Address translation with provision for TLB - 3 marks

(b) method of Allocation using the techniques contiguous, linked & indexed - 2 marks.

Performance comparison for random file access - 2 marks

8(a) Deadlock Recovery

Process termination / Resource preemption

- 4 marks.

(b) Demand Paging

- Dealing with page fault.

- 4 marks.

(c) Thrashing

- Explanation
- Cause of thrashing

- 4 marks