Question-1

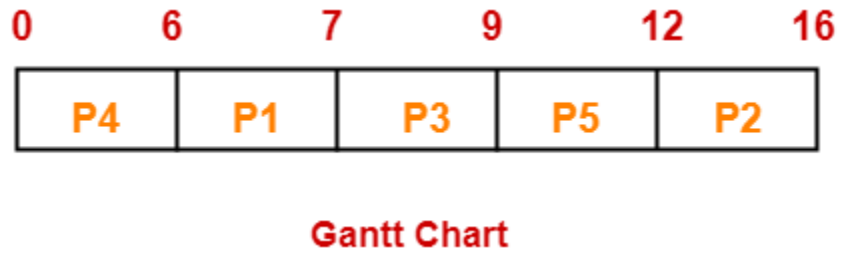
Consider the set of 5 processes whose arrival time and burst time are given below-

Process Id	Arrival time	Burst time
P1	3	1
P2	1	4
P3	4	2
P4	0	6
P5	2	3

If the CPU scheduling policy is SJF non-preemptive, calculate the average waiting time and average turnaround time.

Solution

Gantt Chart-



Gantt Chart

Now, we know-

- Turn Around time = Exit time – Arrival time
- Waiting time = Turn Around time – Burst time

Process Id	Exit time	Turn Around time	Waiting time
P1	7	7 – 3 = 4	4 – 1 = 3
P2	16	16 – 1 = 15	15 – 4 = 11
P3	9	9 – 4 = 5	5 – 2 = 3
P4	6	6 – 0 = 6	6 – 6 = 0
P5	12	12 – 2 = 10	10 – 3 = 7

Now,

- Average Turn Around time = (4 + 15 + 5 + 6 + 10) / 5 = 40 / 5 = 8 unit
- Average waiting time = (3 + 11 + 3 + 0 + 7) / 5 = 24 / 5 = 4.8 unit

Question 2

Write a menu driven shell script which will print the following menu and execute the given task to display the result on standard output. [Use Case Statement of Shell Script Programming]

a. Display calendar of current month

b. Display today's date and time

c. Display usernames those are currently logged in the system

d. Displaying your current working directory.

e. To print all the directories and subdirectories in the

/home/cdac/Downloads folder

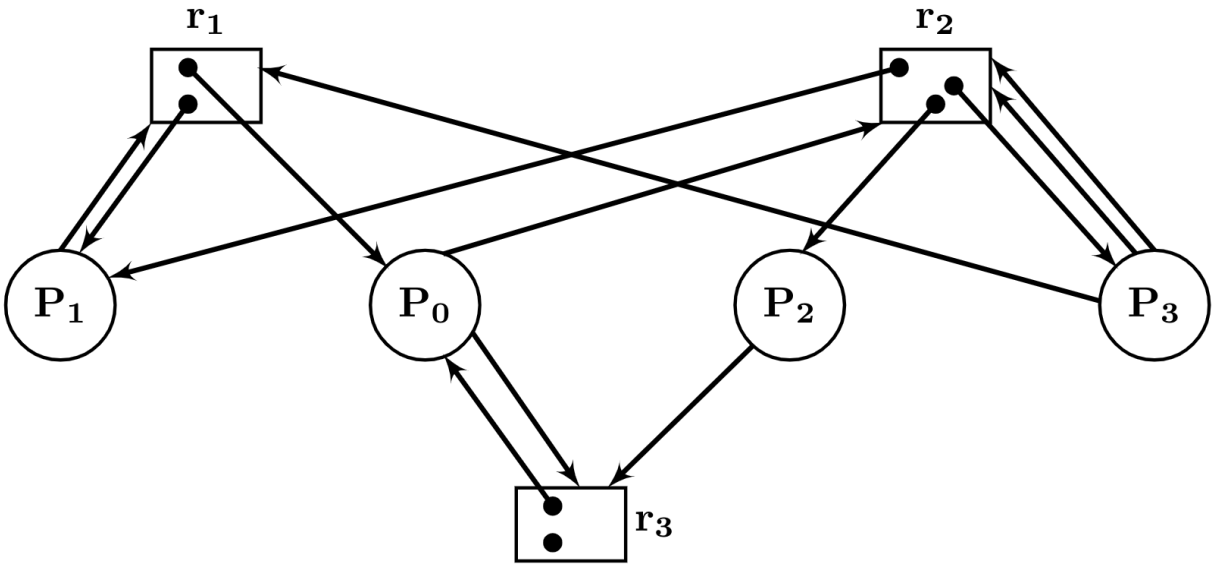
f. To create a tar file and see the contents of tar files

g. To create a record.txt file and add the contents inside it and also append the contents into it and show the contents on the screen.

h. Exit

Question -3

Consider the resource allocation graph in the figure.



A. Find if the system is in a deadlock state
B. Otherwise, find a safe sequence

Answer

From the RAG we can make the necessary matrices.

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Allocation

	r_1	r_2	r_3
P_0	1	0	1
P_1	1	1	0
P_2	0	1	0
P_3	0	1	0

Future Need

	r_1	r_2	r_3
P_0	0	1	1
P_1	1	0	0
P_2	0	0	1
P_3	1	2	0

- $\text{Total} = (2 \quad 3 \quad 2)$
- $\text{Allocated} = (2 \quad 3 \quad 1)$
- $\text{Available} = \text{Total} - \text{Allocated} = (0 \quad 0 \quad 1)$

$P_2's$ need $(0 \quad 0 \quad 1)$ can be met

And it releases its held resources after running to completion

$$A = (0 \quad 0 \quad 1) + (0 \quad 1 \quad 0) = (0 \quad 1 \quad 1)$$

$P_0's$ need $(0 \quad 1 \quad 1)$ can be met

and it releases
$$A = (0 \quad 1 \quad 1) + (1 \quad 0 \quad 1) = (1 \quad 1 \quad 2)$$

$P_1's$ needs can be met $(1 \quad 0 \quad 0)$ and it releases
$$A = (1 \quad 1 \quad 2) + (1 \quad 1 \quad 0) = (2 \quad 2 \quad 2)$$

$P_3's$ need can be met
So, the safe sequence will be $P_2 - P_0 - P_1 - P_3$.

Question -4

A shared variable x, initialized to zero, is operated on by four concurrent processes W, X, Y, Z as follows. Each of the processes W and X reads x from memory, increments by one, stores it to memory, and then terminates. Each of the processes Y and Z reads x from memory, decrements by two, stores it to memory, and then terminates. Each process before reading x invokes the P operation (i.e., wait) on a counting semaphore S and invokes the V operation (i.e., signal) on the semaphore S after storing x to memory. Semaphore S is initialized to two. What is the maximum possible value of x after all processes complete execution?

(A) -2

(B) -1

(C) 1

(D) 2

Answer

Since, initial value of semaphore is 2, two processes can enter a critical section at a time- this is bad and we can see why.

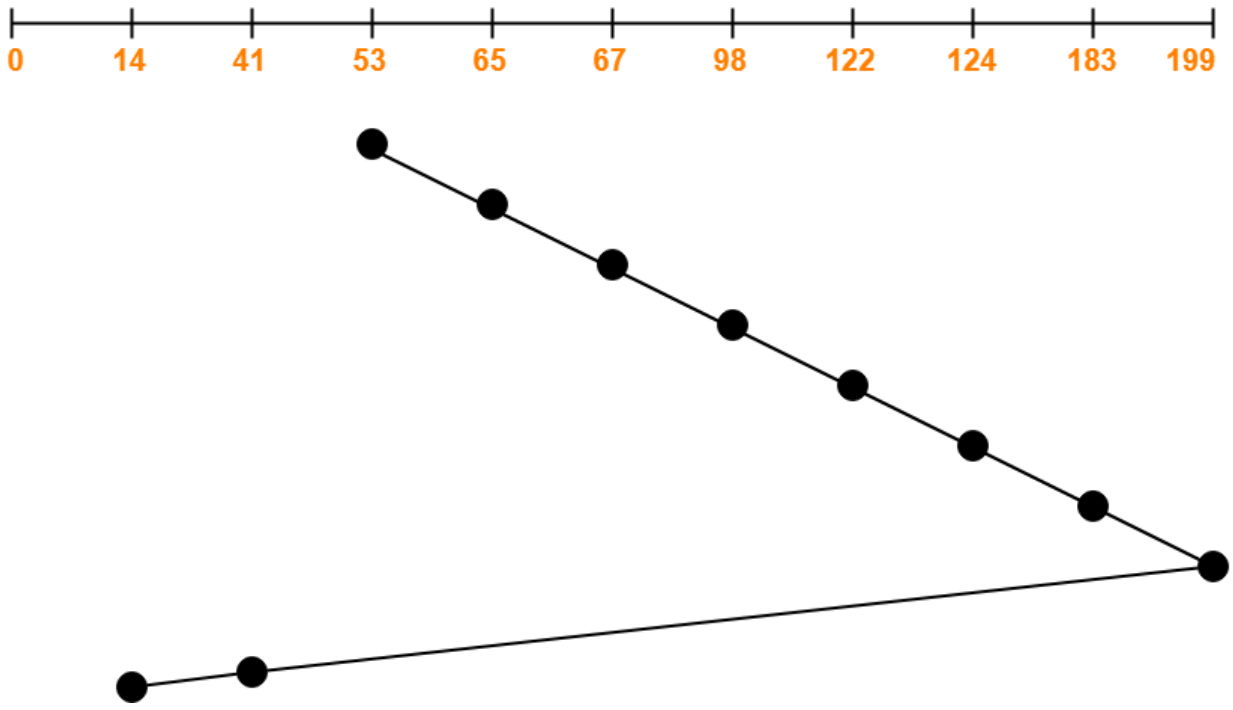
Say, X and Y be the processes. X increments x by 1 and Z decrements x by 2. Now, Z stores back and after this X stores back. So, final value of x is 1 and not −1 and two Signal operations make the semaphore value 2 again. So, now W and Z can also execute like this and the value of x can be 2 which is the maximum possible in any order of execution of the processes.

(If the semaphore is initialized to 1, processed would execute correctly and we get the final value of x as −2.)

Question 5:

Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The SCAN scheduling algorithm is used. The head is initially at cylinder number 53 moving towards larger cylinder numbers on its servicing pass. The cylinders are numbered from 0 to 199. The total head movement (in number of cylinders) incurred while servicing these requests is _____.

Solution-



Total head movements incurred while servicing these requests

= (65 – 53) + (67 – 65) + (98 – 67) + (122 – 98) + (124 – 122) + (183 – 124) + (199 – 183) + (199 – 41) + (41 – 14)

= 12 + 2 + 31 + 24 + 2 + 59 + 16 + 158 + 27

= 331

Alternatively,

Total head movements incurred while servicing these requests

= (199 – 53) + (199 – 14)

= 146 + 185

= 331