CS & IT ENGINEERING

Operating System

CPU Scheduling

DPP 04 Discussion Notes

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01 Question

02 Discussion

Q.1 Which of the following statements is/are correct regarding HRRN scheduling algorithm? **[MSQ]**

A. It reduces waiting time for longer processes.

B. HRRN is preemptive in nature. False

C. HRRN's response ratio can be calculated as (S + W)/S, where S is the service time and W is the waiting time.

D. HRRN favours job with shorter burst time.

$R.R = \frac{W+S}{S}$

i) favors shortest jobs
ii) Limits waiting time of longer jobs.

A, C, D

Q.2

Consider the below table

[MSQ]

Process	Arrival Time	Burst Time
P1	0	7
P2	2	4
P3	4	1
P4	5	4

A, B.

Schedule the above processes using SRTF and SJF, and select the correct option from the following.

A. TAT(SJF) > TAT(SRTF). ✓

B. Waiting time P4(SJF) > Waiting time P3 (SRTF) ✓

C. TAT(SRTF)> TAT(SJF) ✗

D. Waiting time P2(SRTF)< Waiting time P1(SJF) ✗

Process	A.T	B.T	C.T	T.A.T	W.T
P_1	0	~~7~~ 5	7	7	0
P_2	2	~~4~~ ~~7~~ 0	12	10	6
P_3	4	~~1~~ 0	8	4	3
P_4	5	~~4~~ 0	16	11	7

SJF

Avg TAT for SJF $\Rightarrow \frac{32}{4} = 8$ units

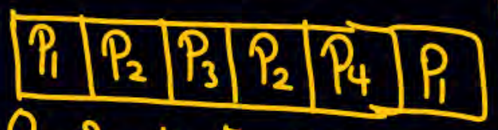
32 units

$32 > 28$

$P_4 : 7 > P_3 : 0$

SJF :

SRTF:



$P_2 : 1 > P_1 : 0$

	C.T	T.A.T	W.T
P_1	16	16	9
P_2	7	5	1
P_3	5	1	0
P_4	11	6	2

SRTF

Avg TAT for SRTF $\Rightarrow \frac{28}{4} = 7$ units

28 units

Q.3

How many of the following scheduling algorithms may cause starvation?

[NAT]

i. First-come-first-serve ✗
ii. Priority ✓
iii. Shortest process next ✓
iv. Shortest remaining time first ✓

= 3

CPU Sch. alg	Starvation
FCFS	✗
SJF	✓
Preemp. SJF	✓
Round Robin	✗
Priority based	✓
LJF	✓
LRTF	✗
HRRN	✗

Q.4

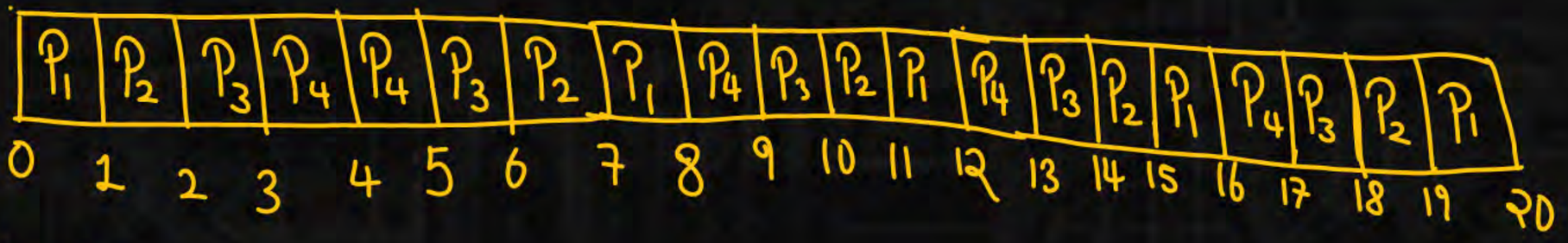
[NAT]

Consider the following processes:

Process	Arrival Time	Burst Time	C.T	T.A.T	W.T
P1	0	~~5 4 3~~ 20	20	20	15
P2	1	~~5 4 3~~ 20	19	18	13
P3	2	~~5 4 3~~ 20	18	16	11
P4	3	~~5 4 3~~ 20	17	14	9

Avg. TA.T
$\Rightarrow \frac{68}{4} = 17$

Calculate the sum of waiting time of process P4 and average turnaround time using LRTF scheduling algorithm? (if burst time of two process is same schedule the process with higher arrival time)



$9 + 17 \Rightarrow$ 26 units

Q.5

Consider the set of 5 processes whose arrival time and burst time are given below: **[NAT]**

Process	Arrival Time	Burst Time
P0	0	4
P1	3	5
P2	4	6
P3	5	5
P4	8	3

$X * Y + Z$

$\Rightarrow 3 * 9.8 + 5.2$

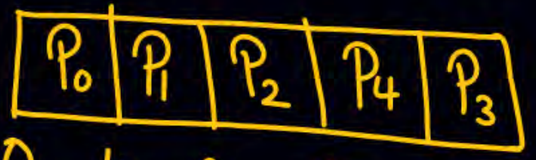
$\Rightarrow 34.6$ units

If the CPU scheduling policy is Highest Response Ratio Next, X is response ratio of last process scheduled, Y is the average turnaround time, and Z is the average waiting time. Calculate X * Y + Z? (upto 1 decimal point)

Process	A.T	B.T	C.T	T.A.T	W.T
P_0	0	4	4	4	0
P_1	3	5	9	6	1
P_2	4	6	15	11	5
P_3	5	5	23	18	13
P_4	8	3	18	10	7

$\frac{26}{5} : 5.2$

$\frac{49}{5} = 9.8$



$X = 3$

$Y = 9.8$

$Z = 5.2$

$R.R_1 = \frac{1+5}{5} = \frac{6}{5} = 1.2$ ✓

$RR_2 = \frac{0+6}{6} = 1$

$RR_2 = \frac{5+6}{6} = \frac{11}{6} \Rightarrow 1.8$ ✓

$RR_3 \Rightarrow \frac{4+5}{5} = \frac{9}{5} = 1.8$

$RR_4 \Rightarrow \frac{1+3}{3} = \frac{4}{3} = 1.3$

$R.R_3 = \frac{10+5}{5} = \frac{15}{5} = 3$

$R.R_4 = \frac{7+3}{3} = \frac{10}{3} = 3.33$ ✓

Q.6

Match the following groups.

[MCQ]

Group-I	Group-II
A. FCFS	1. Used in time sharing system
B. SJF	2. Used in real time system
C. Priority scheduling	3. Minimum average waiting time
	4. Convoy effect

A. A-2, B-1, C-3 ×

B. A-4, B-3, C-2 ✓

C. A-2, B-3, C-1 ×

D. A-4, B-2, C-3

A-4, B-3, C-2

Q.7

Consider the three processes for a particular system P1, P2, P3. The arrival time of the processes are 0ms, 5ms and 8ms respectively. And the processing times are 15ms, 12ms and 5ms respectively. The three processes are pre-emptively scheduled on a single-CPU system using the shortest remaining processing time first scheduling policy. Which of the following shows the order in which processes are completed?

[MCQ]

A. P2, P1, P3

B. P3, P1, P2

C. P3, P2, P1

D. P1, P2, P3

Process	A.T	B.T	C.T	
P_1	0	~~15~~ ~~10~~ ~~7~~ 0	20	
P_2	5	12	32	
P_3	8	~~5~~ 0	13	

P_3 P_1 P_2

Q.8

Consider the following set of processes with the arrival times and burst times. Processes are scheduled using highest response ratio next.

[NAT]

Process	Arrival Time	Burst Time
A	0	4
B	2	1
C	4	3
D	5	5

(All time in milliseconds)

The average waiting time of processes are 1.5 (ms).

(Upto 1 decimal place)

Response Ratio = $\frac{W+S}{S}$

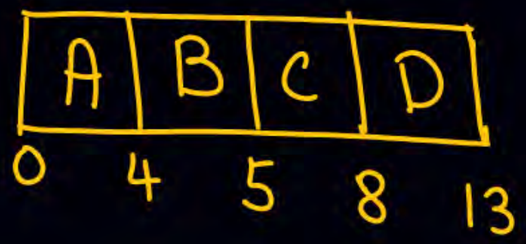
Processes	A.T	B.T	C.T	T.A.T	W.T
A	0	4	4	4	0
B	2	1	5	3	2
C	4	3	8	4	1
D	5	5	13	8	3

$R.R_B = \frac{2+1}{1} = 3$ ✓

$R.R_C = \frac{0+3}{3} = 1$

$R.R_C = \frac{1+3}{3} = \frac{4}{3} = 1.33$ ✓

$R.R_D = \frac{0+5}{5} = 1$



Avg. W.T $\Rightarrow \frac{2+1+3+0}{4} \Rightarrow \frac{6}{4} \Rightarrow$ 1.5 milli sec


THANK YOU GW
SOLDIERS !