OS-2 Quiz-1

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Q1) 5 jobs A through E are arrived and information regarding them is as follows

JOB NAME	RUNNING TIME (min)	PRIORITY
A	15	6
B	9	3
C	3	7
D	6	9
E	12	4

Asked to find the turnaround time for each process and average of turnaround for all processes

All processes are submitted at time 0.

Turn around time is the time duration between submission of process and its completion.

a) Round robin with time quantum 1 min

Time quantum is 1 min and there are 5 processes initially so each process gets 1 min of run time in every 5 min.

- So after 2 cycles each process has run for 2 min and C will have only 1 min left to run so at t=13 min C will be finished.
- At t=15 each process ran for 3 min and now we only have 4 ready processes.
- So each process gets 1 min in every 4 min.
- At t=15+2*4=23 each remaining process ran for 5 min and process D will have only one min left to run.
- So at t=23+3=26 process D will finish running, at t=27 all processes ran for 6 min and only 3 processes left to run so each process gets 1 min in every 3 min to run.
- At t=27+2*3=33 each remaining process ran for 8 min and process B has only 1 min left to finish and at t=35 process B finishes running.
- So at t=36 only 2 processes are left to run and each process gets 1 min in every 2 min.

- At t=36+2*2=40 process E has only 1 min left to run and hence finishes at t=42, now process A is left and is there only one so it continuously run for next 3 min to finish at t=45.
- Therefore turnaround time of A=45 min, B=35, C=13, D=26, E= 42 min.
- Therefore average turnaround time is T_avg=(45+35+13+26+42)/5=32.2 min.

b) Priority scheduling

The Gantt chart is as follows

B	E	A	C	D	
T=0	9	21	36	39	45

Therefore, the turnaround time for A=36, B=9, C=39, D=45, E=21 min

Average turnaround time T_avg=(36+9+39+45+21)/5=30 min.

c) FCFS in A B C D E order

A	B	C	D	E	
T=0	15	24	27	33	45

Therefore, turnaround time for A=15, B=24, C=27, D=33, E=45 min

Average turnaround time T_avg=(15+24+27+33+45)/5=28.8 min.

d) Shortest job first

C	D	B	E	A	
T=0	3	9	18	30	45

Therefore, turnaround time for A=45, B=18, C=3, D=9, E=30 min

Average turnaround time T_avg=(3+9+18+30+45)/5=21 min.

Q2)

For the given NRR scheduling the time quanta starts at 40 ms and decreases by 10 ms for every round until it becomes a min of 10 ms.

Given 3 processes are A B C with expected burst times 100, 120, 60 ms respectively.

a)

The Gantt chart is as follows.

A	B	C	A	B	C	A	B	A	B

T=0 40 80 120 150 180 200 220 240 250 260

Continuation of the chart here

B	B

T=260 270 280

Waiting time for A is Ta=0 +80+50+20=150 ms.

Waiting time for B is Tb= 40+70+40+10=160 ms.

Waiting time for c is Tc= 80+60=140 ms.

The average waiting time is T_avg=(150+160+140)/3 = 150 ms.

b)

Advantages:

- By this modified RR scheduling the waiting time of the smaller burst time processes will be decreased and also the turnaround time.
- If any new processes enters in middle with comparatively smaller burst time it can get finish faster despite having a high initial time quanta.

Disadvantages:

- Waiting time of Processes with longer CPU bursts increases. Especially when a new process is added with lesser burst time.
- If a no of processes are more with high burst time the waiting time increases a lot ,as the time quanta is decreasing and the no of cycles require to finish processes increases.

Q3)

Let A B C D E be the five processes whose expected run times are 9,6,3,5,and X.

Assuming a non-preemptive scheduling system

- If a process with a longer CPU burst is sent first it will make other processes to wait so the average response time for all the other processes will increases.

- The sum of all other processes reaction time is same as sum of all processes reaction times as reactance time of first process is 0.
- So the longest one should be sent at the last which is max(9,X) i.e. A or E.
- Sending the shortest CPU burst process helps in minimizing the sum of all reactance time and hence the average so we send the min(3,X) i.e. C or E first to the CPU.
- Hence following the shortest job first scheduling will minimize the average reaction time.
- So the order in which we have to send processes in is ascending order of their CPU bust times in order to get a minimum possible average reaction time.
- i.e. Ascending order of (3,5,6,9,X).

Q4)

a) given that for 2 processes P1, P2

p1=40, t1=25, p2=75, t2= 30.

The CPU utilization of P1=25/40=0.625

The CPU utilization of P2=30/75=0.4

The total CPU utilization is = 0.625+0.4 =1.025 which is greater than 1 hence these two processes can't be scheduled using rate-monotonic scheduling.

Showing the same by Gantt chart

We assign P1 higher priority as period of P1 is shorter than P2.

So the Gantt chart looks like

P1	P2	P1	P2

T=0 25 40 65 75 80

Period 1 period-2

As can be seen from above chart P2 is supposed to be finished by less than 75 time units but the scheduling caused it to finish at t=80 resulting it to miss it's deadline

Hence it is not possible to schedule P1 P2 using rate-monotonic scheduling.

b) Scheduling Processes P1 and P2 using earliest deadline first method .

The Gantt chart for the processes P1 and P2 are as follows

P1	P2	P2	P1	P1	P2	P2	P1	P1……	

T=0 25 40 55 80 (same thing repeats)

Period-1 period 2 period 3

- We assign P1 higher priority as period of P1 is shorter than P2.
- So first P1 runs for 25 time units then P2 for 15 as each cycle is 40 time units.
- In second cycle P2 has a deadline at t=75 and P1 at t=80 so P2 runs for remaining 15 time units and then at t=55 P1 runs for 25 units i.e. t=80.
- The same thing repeats again and again.
- This scheduling is possible if and only if the dead lines of P1 equals to p1 i.e. d1=40, d2<=75.
- If the d1<40 scheduling may not be possible.

Q5)

Given that a multitasking system following RMS has 5 tasks in a given time span which are

• Task P1: Processing Time C1 = 20; Period T1 = 90

• Task P2: Processing Time C2 = 30; Period T2 = 250

• Task P3: Processing Time C3 = 70; Period T3 = 370

• Task P4: Processing Time C4 = 50; Period T4 = 330

• Task P5: Processing Time C5 = 125; Period T5 = 2000

The CPU utilization by a process is given by

utilization fraction = processing time/ period

The CPU utilization of P1=20/90= 0.2222

The CPU utilization of P2=30/250= 0.12

The CPU utilization of P3=70/370= 0.1891

The CPU utilization of P4=50/330= 0.1515

The CPU utilization of P5=125/2000= 0.0625

Therefore total CPU utilization by 5 processes is
=0.2222+0.12+0.1891+0.1515+0.0625=0.7453

The upper bound on the CPU utilization percentage for n processes for RMS is given by

Upper bound=n(2^(1/n)-1)

N=5 gives us

Upper bound = 5*(1.148-1)=0.7435

Since the used CPU fraction (0.7453)> upper bound (0.7435)

Hence if the RMS is used the tasks can’t be successfully scheduled as utilization fraction exceeds the upper bound.