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Operating Systems
Due 02/17/16

Homework 4

Question 2.

Job	Arrival Time (ms)	Run Time (ms)
A	0	30
B	0	30
C	30	10
D	50	10

$T_{turnound} = T_{completion} - T_{arrival}$

$T_{response} = T_{first\_run} - T_{arrival}$

a) First-In First-Out (FIFO)

Time (ms)	0	10	20	30	40	50	60	70	80
Running Job	A	A	A	B	B	B	C	D	-
Events	A,B arrive			A finish C arrive		D arrive	B finish	C finish	D finish

Average turnaround time:
$T_{turnound\_A} = 30ms - 0ms = 30ms$
$T_{turnound\_B} = 60ms - 0ms = 60ms$
$T_{turnound\_C} = 70ms - 30ms = 40ms$
$T_{turnound\_D} = 80ms - 50ms = 30ms$
$T_{turnound\_average} = (30ms + 60ms + 40ms + 30ms) / 4 = 40ms$

Average response time:
$T_{reponse\_A} = 0ms - 0ms = 0ms$
$T_{reponse\_B} = 30ms - 0ms = 30ms$
$T_{reponse\_C} = 60ms - 30ms = 30ms$
$T_{reponse\_D} = 70ms - 50ms = 20ms$
$T_{reponse\_average} = (0ms + 30ms + 30ms + 20ms) / 4 = 20ms$

b) Shortest Time-to-Completion First (STCF)

Time (ms)	0	10	20	30	40	50	60	70	80
Running Job	A	A	A	C	B	D	B	B	-
Events	A, B arrive			A finish C arrive	C finish	D arrive D preempt B	D finish		B finish

Average turnaround time:
$T_{turnound\_A}$ = 30ms - 0ms = 30ms
$T_{turnound\_B}$ = 80ms - 0ms = 80ms
$T_{turnound\_C}$ = 40ms - 30ms = 10ms
$T_{turnound\_D}$ = 60ms - 50ms = 10ms
$T_{turnound\_average}$ = (30ms + 80ms + 10ms + 10ms) / 4 = 32.5ms

Average response time:
$T_{reponse\_A}$ = 0ms - 0ms = 0ms
$T_{reponse\_B}$ = 40ms - 0ms = 40ms
$T_{reponse\_C}$ = 30ms - 30ms = 0ms
$T_{reponse\_D}$ = 50ms - 50ms = 0ms
$T_{reponse\_average}$ = (0ms + 40ms + 0ms + 0ms) / 4 = 10ms

c) Multi-Level Feedback Queue (MLFQ)

Time (ms)	0	10	20	30	40	50	60	70	80
Queue 1	**A_0** → B_0	**B_0**		**C_0**		**A_{20}** → B_{20} → D_0	**B_{20}** → D_0	**D_0**	
Queue 2		A_{10}	**A_{10}** → B_{10}	B_{10}	**B_{10}**				
Queue 3				A_{20}	A_{20}				
Queue 4									
Events	A, B arrive			C arrive	C finish	D arrive Priority reset	A finish	B finish	D finish

*Currently running job is **bolded** (not circled)
**For queue changes occurring in the same time slice, job ordering is alphabetical

Average turnaround time:
$T_{turnound\_A}$ = 60ms - 0ms = 60ms
$T_{turnound\_B}$ = 70ms - 0ms = 70ms
$T_{turnound\_C}$ = 40ms - 30ms = 10ms
$T_{turnound\_D}$ = 80ms - 50ms = 30ms
$T_{turnound\_average}$ = (60ms + 70ms + 10ms + 30ms) / 4 = 42.5ms

Average response time:
$T_{reponse\_A}$ = 0ms - 0ms = 0ms
$T_{reponse\_B}$ = 10ms - 0ms = 10ms
$T_{reponse\_C}$ = 30ms - 30ms = 0ms
$T_{reponse\_D}$ = 70ms - 50ms = 20ms
$T_{reponse\_average}$ = (0ms + 10ms + 0ms + 20ms) / 4 = 7.5ms