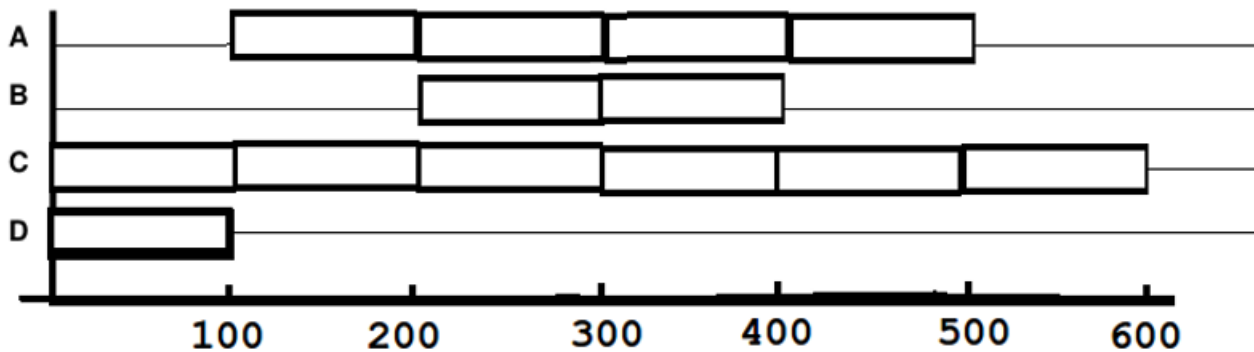


## 1. 2016-1

	Kombinasi Multiprogram (%)														
	A	B	C	D	A+B	A+C	A+D	B+C	B+D	C+D	A+B+C	A+B+D	A+C+D	B+C+D	A+B+C+D
Utilitas CPU per proses A	10	-	-	-	9.3	9.3	9.2	-	-	-	8.3	8.1	7.8	-	7
Utilitas CPU per proses B	-	20	-	-	19	-	-	18	17	-	17	16	-	15	14
Utilitas CPU per proses C	-	-	30	-	-	28	-	26	-	25	25	-	23	22	21
Utilitas CPU per proses D	-	-	-	40	-	-	37	-	35	33	-	32	31	30	28

Diagram berikut ini dibentuk menggunakan data tabel di atas.



- Berapa waktu CPU (CPU TIME) dari proses "A"?
- Berapa waktu CPU (CPU TIME) dari proses "B"?
- Berapa waktu CPU (CPU TIME) dari proses "C"?
- Berapa waktu CPU (CPU TIME) dari proses "D"?
- Berapa waktu total (TOTAL TIME) dari proses "A"?
- Circle or cross "T" if true, and "F" if false:  
[ T / F ] Priority scheduling prevents starvation.

## 2. 2016-2

There exists four (4) identical processes, with this following CPU utilization table:

	Multiprogramming Combination (%)			
	A	A + A	A + A + A	A + A + A + A
CPU utilization per proses A	10	9.5	9	8.6

The CPU time of each processes is 43 seconds

Print the output when the system runs:

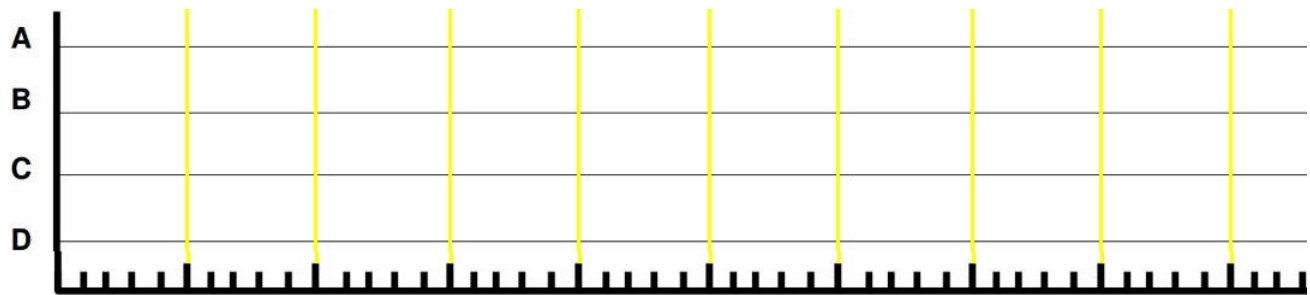
- How long will be the total time to run concurrently all (4) processes together?!
- How long will be the total time to run all (4) processes one by one?!

## 3. 2017-1

	Kombinasi Multiprogram (%)														
	A	B	C	D	A+B	A+C	A+D	B+C	B+D	C+D	A+B+C	A+B+D	A+C+D	B+C+D	A+B+C+D
Utilitas CPU per proses A	10	-	-	-	9.3	9.3	9.2	-	-	-	8.3	8.1	7.8	-	7
Utilitas CPU per proses B	-	20	-	-	19	-	-	18	17	-	17	16	-	15	14
Utilitas CPU per proses C	-	-	30	-	-	28	-	26	-	25	25	-	23	22	21
Utilitas CPU per proses D	-	-	-	40	-	-	37	-	35	33	-	32	31	30	28

Proses A dan B berjalan sejak  $t=0$ . Proses C mulai berjalan saat waktu CPU (*CPU time*) proses B mencapai 38 satuan waktu. Proses A berhenti setelah proses C berjalan selama 200 satuan waktu. Proses D hanya dijalankan setelah proses A berhenti. Semua proses yang masih berjalan berhenti pada saat  $t=600$ .

(a) Lengkapi diagram berikut ini:



- (b) Berapa waktu CPU (*CPU TIME*) proses "A"?
- (c) Berapa waktu CPU (*CPU TIME*) proses "B"?
- (d) Berapa waktu CPU (*CPU TIME*) proses "C"?
- (e) Berapa waktu CPU (*CPU TIME*) proses "D"?
- (f) Berapa waktu total (*TOTAL TIME*) proses "A" berjalan?
- (g) Berapa waktu total (*TOTAL TIME*) proses "B" berjalan?
- (h) Berapa waktu total (*TOTAL TIME*) proses "C" berjalan?
- (i) Berapa waktu total (*TOTAL TIME*) proses "D" berjalan?

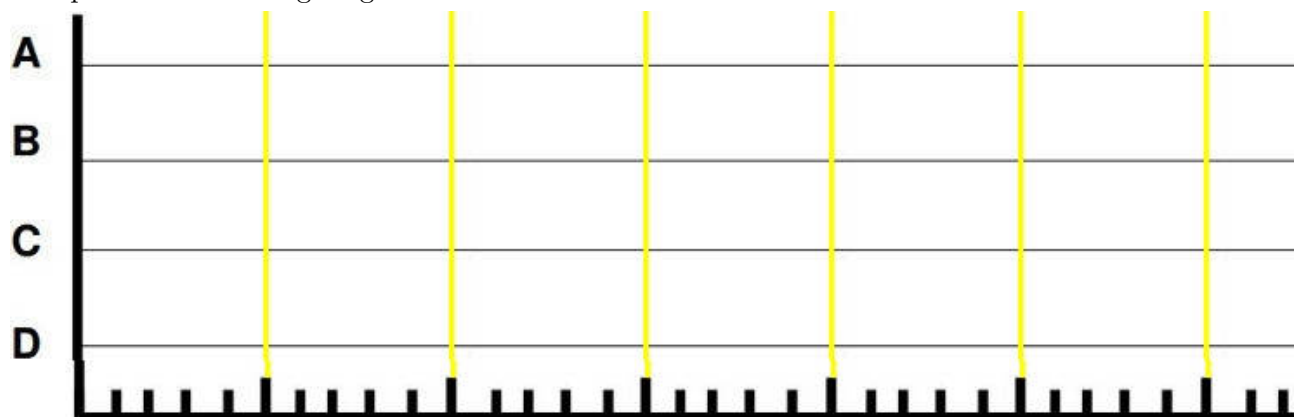
#### 4. 2017-2

Four (4) processes, A(90%, 14), B(80%, 60), C(70%, 64), D(60%, 161); where  $[W(X\%, Y)]$ ; W=process name; X= I/O Wait(%); Y=CPU Time] with this following CPU utilization table:

	Multiprogramming Combination (%)														
	A	B	C	D	A+B	A+C	A+D	B+C	B+D	C+D	A+B+C	A+B+D	A+C+D	B+C+D	A+B+C+D
Process A CPU utilization	10	-	-	-	9.3	9.3	9.2	-	-	-	8.3	8.1	7.8	-	7
Process B CPU utilization	-	20	-	-	19	-	-	18	17	-	17	16	-	15	14
Process C CPU utilization	-	-	30	-	-	28	-	26	-	25	25	-	23	22	21
Process D CPU utilization	-	-	-	40	-	-	37	-	35	33	-	32	31	30	28

All processes (A, B, C, and D) terminates at  $t=500$ . Process D starts at  $t=0$ . Processes A, B, and C start after process D.

(a) Complete this following diagram:



- (b) Calculate at what time processes A, B, and C start!
- (c) How long will be the TOTAL TIME of process D, if the process (D) runs alone?

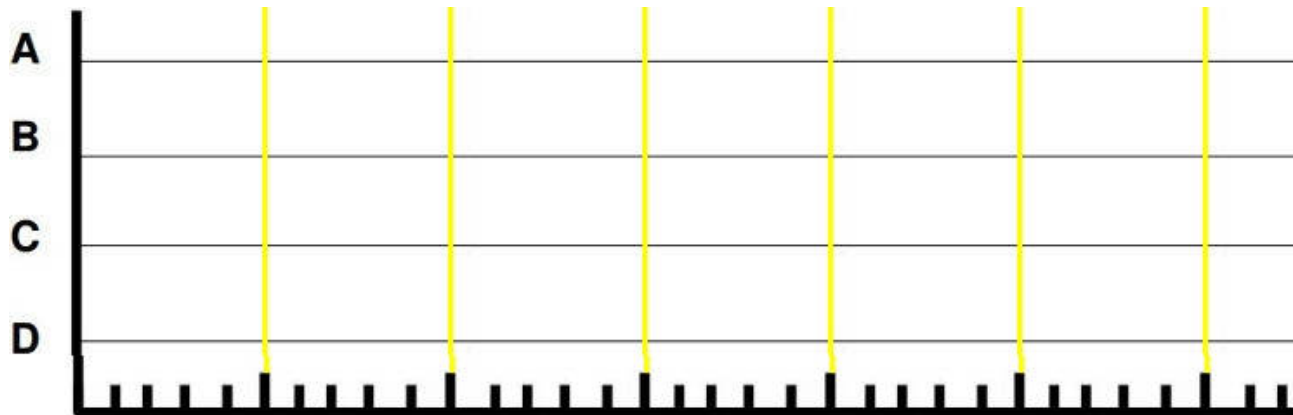
## 5. 2018-1

Four (4) processes, A(46.8), B(17.0), C(53.0), D(37.0); where [X(Y); X = process name; Y = CPU Time] with this following CPU utilization table:

	Multiprogramming Combination (%)														
	A	B	C	D	A+B	A+C	A+D	B+C	B+D	C+D	A+B+C	A+B+D	A+C+D	B+C+D	A+B+C+D
Process A CPU utilization	10	-	-	-	9.3	9.3	9.2	-	-	-	8.3	8.1	7.8	-	7
Process B CPU utilization	-	20	-	-	19	-	-	18	17	-	17	16	-	15	14
Process C CPU utilization	-	-	30	-	-	28	-	26	-	25	25	-	23	22	21
Process D CPU utilization	-	-	-	40	-	-	37	-	35	33	-	32	31	30	28

Processes A, B, and C start at t=0, and process D starts at t=300.

(a) Complete this following diagram, including the time of the X-axis!



(b) What is the TOTAL TIME of process A?

(c) What is the TOTAL TIME of process B, if the process runs alone?

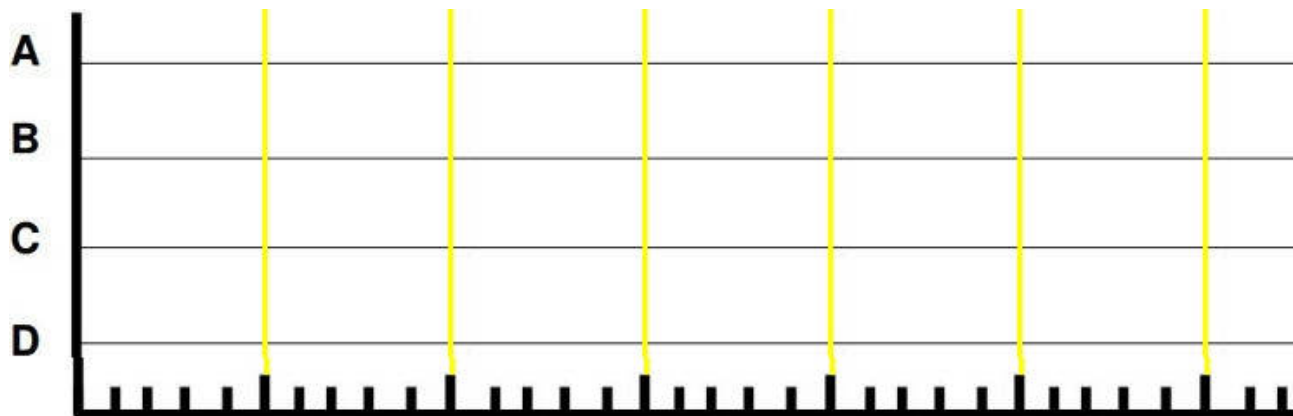
## 6. 2018-2

Four (4) processes, A(460), B(540), C(280), D(320); where [X(Y); X = process name; Y = CPU Time] with this following CPU utilization table:

	Multiprogramming Combination (%)														
	A	B	C	D	A+B	A+C	A+D	B+C	B+D	C+D	A+B+C	A+B+D	A+C+D	B+C+D	A+B+C+D
Process A CPU utilization	10	-	-	-	9.3	9.3	9.2	-	-	-	8.3	8.1	7.8	-	7
Process B CPU utilization	-	20	-	-	19	-	-	18	17	-	17	16	-	15	14
Process C CPU utilization	-	-	30	-	-	28	-	26	-	25	25	-	23	22	21
Process D CPU utilization	-	-	-	40	-	-	37	-	35	33	-	32	31	30	28

Processes A, B, and D start at t=0, and process C starts at t=3000.

(a) Complete this following diagram, including the time of the X-axis!



(b) What is the TOTAL TIME of process A?

(c) What is the TOTAL TIME of process D, if the process runs alone?

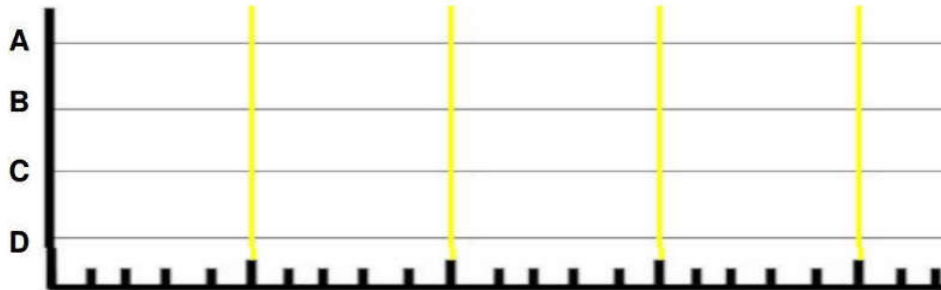
## 7. 2019-1 (82.8%)

Four (4) processes, A(286), B(360), C(280), D(350); where [X(Y); X = process name; Y = CPU Time] with this following CPU utilization table:

	Multiprogramming Combination (%)														
	A	B	C	D	A+B	A+C	A+D	B+C	B+D	C+D	A+B+C	A+B+D	A+C+D	B+C+D	A+B+C+D
Process A CPU utilization	10	-	-	-	9.3	9.3	9.2	-	-	-	8.3	8.1	7.8	-	7
Process B CPU utilization	-	20	-	-	19	-	-	18	17	-	17	16	-	15	14
Process C CPU utilization	-	-	30	-	-	28	-	26	-	25	25	-	23	22	21
Process D CPU utilization	-	-	-	40	-	-	37	-	35	33	-	32	31	30	28

Processes A and C: **start** at t=0; **end** before t=4000. Processes B and D: **start** after t=0; **end** at t=4000.

(a) (84%) Complete this following diagram, including the time of the X-axis!



- (b) (83%) What is the TOTAL TIME of process A? \_\_\_\_\_
- (c) (83%) What is the TOTAL TIME of process B? \_\_\_\_\_
- (d) (87%) What is the TOTAL TIME of process C? \_\_\_\_\_
- (e) (86%) What is the TOTAL TIME of process D? \_\_\_\_\_

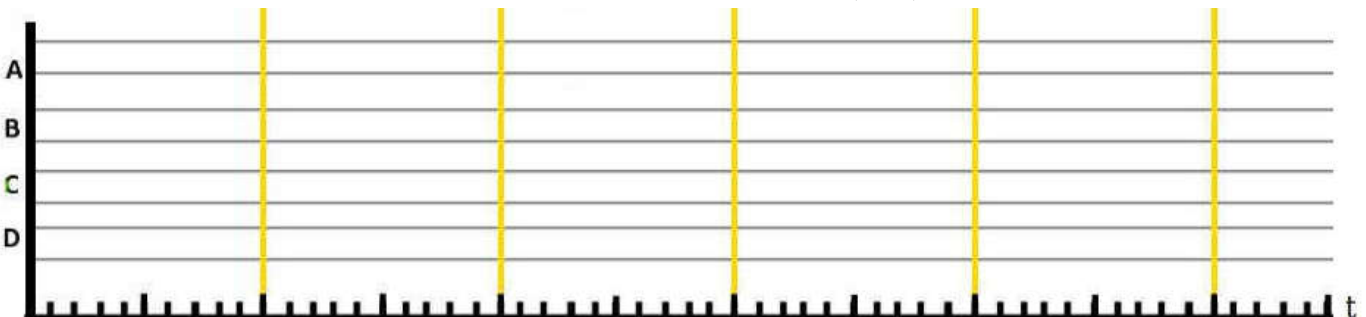
## 8. 2019-2 (76.0%)

Four (4) processes, A(314), B(830), C(420), D(880); where [X(Y); X = process name; Y = CPU Time] with this following CPU utilization table:

	Multiprogramming Combination (%)														
	A	B	C	D	A+B	A+C	A+D	B+C	B+D	C+D	A+B+C	A+B+D	A+C+D	B+C+D	A+B+C+D
Process A CPU utilization	10	-	-	-	9.3	9.3	9.2	-	-	-	8.3	8.1	7.8	-	7
Process B CPU utilization	-	20	-	-	19	-	-	18	17	-	17	16	-	15	14
Process C CPU utilization	-	-	30	-	-	28	-	26	-	25	25	-	23	22	21
Process D CPU utilization	-	-	-	40	-	-	37	-	35	33	-	32	31	30	28

All processes **end** at t=5000.

(a) Complete this following diagram, including the time of the X-axis (72%)!



- (b) What is the TOTAL TIME of process A (81%)? \_\_\_\_\_
- (c) What is the TOTAL TIME of process B (79%)? \_\_\_\_\_
- (d) What is the TOTAL TIME of process C (83%)? \_\_\_\_\_
- (e) What is the TOTAL TIME of process D (80%)? \_\_\_\_\_