Operating System
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OS 2021 Problem Sheet #6

Problem 6.1: scheduling strategies

Process	Arrival time	Execution time
A	0	9
B	4	8
C	6	2
D	8	5
E	13	4
F	15	1

a)

   i.   FCFS

Process	Arrival time	Execution time	Completion time	Turnaround time $_{(Ct - At)}$ or $(Wt + Et)$	Waiting time $_{(TAT -Et)}$	Response time
A	0	9	9	9	0	0
B	4	8	17	13	5	5
C	6	2	19	13	11	11
D	8	5	24	16	11	11
E	13	4	28	15	11	11
F	15	1	29	14	13	14

P_A	P_B	P_C	P_D	P_E	P_F	////////
9	17	19	24	28	29	

$$\bar{T} = \frac{(9-0) + (17-4) + (19-6) + (24-8) + (28-13) + (29-15)}{6} = 13.33$$

$$\bar{W} = \frac{0 + (9-4) + (17-6) + (19-8) + (24-13) + (28-15)}{6} = 8.5$$

   ii.   SPTF

Process	Arrival time	Execution time	Completion time	Turnaround time $_{(Ct - At)}$ or $(Wt + Et)$	Waiting time $_{(TAT -Et)}$	Response time
A	0	9	9	9	0	0
B	4	8	29	25	17	17
C	6	2	11	5	3	3
D	8	5	16	8	3	3
E	13	4	21	8	4	4
F	15	1	17	2	1	1

P_A	P_C	P_D	P_F	P_E	P_B	////////
9	11	16	17	21	29	

$$\bar{T} = \frac{(9-0)+(11-6)+(16-8)+(17-15)+(21-13)+(29-4)}{6} = 9.5$$

$$\bar{W} = \frac{0+(9-6)+(11-8)+(16-15)+(17-13)+(21-4)}{6} = 4.667$$

iii. LPTF

Process	Arrival time	Execution time	Completion time	Turnaround time (Ct - At) or (Wt + Et)	Waiting time (TAT -Et)	Response time
A	0	9	9	9	0	0
B	4	8	17	13	5	15
C	6	2	28	22	20	20
D	8	5	22	14	9	9
E	13	4	26	13	9	9
F	15	1	29	14	13	13

P_A	P_B	P_D	P_E	P_C	P_F	////////
9	17	22	26	28	29	

$$\bar{T} = \frac{(9-0)+(17-4)+(22-8)+(26-13)+(28-6)+(29-15)}{6} = 14.1667$$

$$\bar{W} = \frac{0+(9-4)+(17-8)+(22-13)+(26-6)+(28-15)}{6} = 9.33$$

iv. RR

Process	Arrival time	Execution time	Completion time	Turnaround time (Ct - At) or (Wt + Et)	Waiting time (TAT -Et)	Response time
A	0	9	22	22	13	0
B	4	8	29	25	17	0
C	6	2	11	5	3	0
D	8	5	27	19	14	0
E	13	4	28	15	11	0
F	15	1	11	14	13	0

Ready queue:

P_A	P_A	P_A	P_A	P_B	P_A	P_B	P_C	P_A	P_B	P_C	P_D	P_A	P_B	P_D	P_E	P_A	P_B	P_D	P_E	P_F	P_A	P_B	P_D	P_E	P_B	P_D	P_E	P_B
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

$$\bar{T} = \frac{(22 - 0) + (29 - 4) + (11 - 6) + (27 - 8) + (28 - 13) + (21 - 15)}{6} = 15.33$$

$$\bar{W} = \frac{(22 - 9) + (25 - 8) + (5 - 2) + (19 - 5) + (15 - 4) + (14 - 1)}{6} = 11.83$$

Problem 6.2: linking

a)

file	symbol	internal	external	Weak symbol	Strong symbol
a.c	x		*		
a.c	y			*	
a.c	z	*			
a.c	f	*			
a.c	g				*

b.c	x				*
b.c	y	*			
b.c	z	*			
b.c	f				*
b.c	g		*		

b) The output is an error message. The linking is not possible because of the following reasons:

```
b.c: f()
a.c: g()
a.c: f()
```

c) Name mangling is the process of encoding a function or a variable name into a different name so that linkers can separate common names in the language. Basically, it assists us into changing or encoding similar names of functions and variables from names in the language or even in other files that we are trying to link.

Programming languages like c++ use name mangling because it's used to facilitate overloading feature and visibility within different scopes.

The " extern "c" {} " linkage specifier is declared so as to prevent the C++ compiler from mangling the name of certain functions or declarations.

For example:
```
extern "C" {
   void special_function(int){
      /* not mangled */
   }
};
```

Source: https://www.ibm.com/docs/en/i/7.2?topic=linkage-name-mangling-c-only