MATH F113X: Introduction to Scheduling

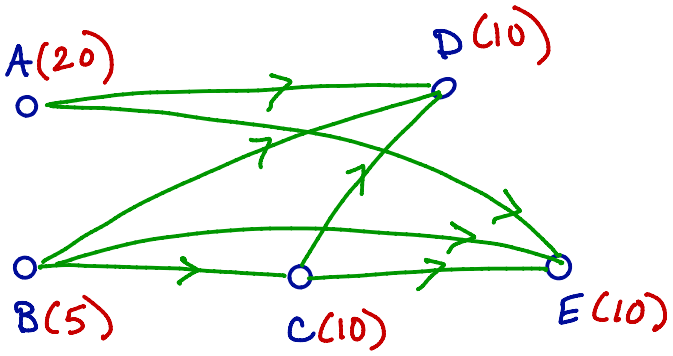
Goal Learn about the following terminology: schedule, digraph, processors, finishing time, optimal finishing time, optimal schedule, idle time, critical time, priority list. critical path.

1. **Motivating Example** Fixing a Flat Bike Tire

label	task	time	dependence
A	buy a replacement tube	20 minutes	
B	find tools	5 minutes	
C	remove tire and tube	10 minutes	B
D	replace tire and new tube	10 minutes	A, B, C
E	repair old tube	10 minutes	C, B, A

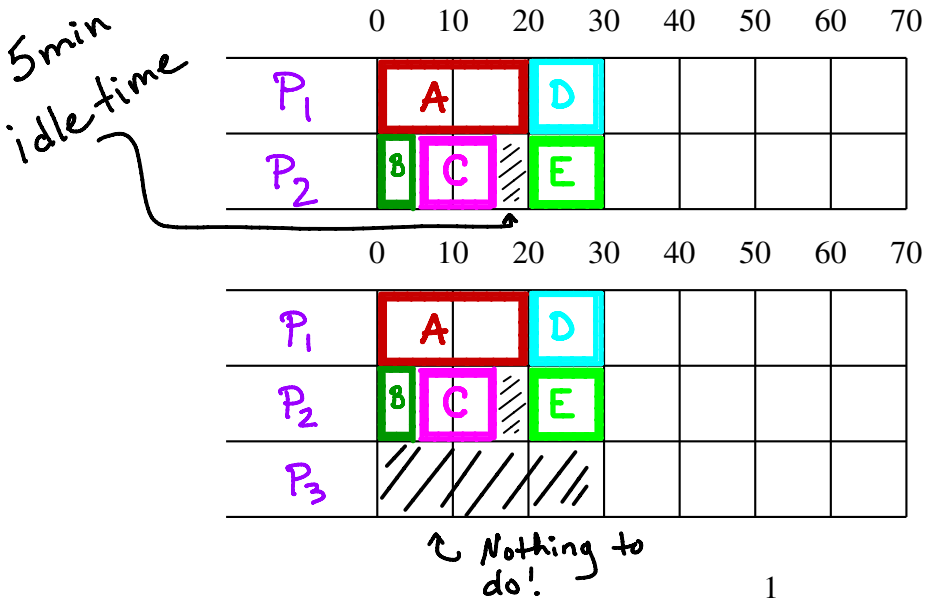
- 1 person will need 55 min.
- order: ABCDE

digraph model



critical path
AD wgt = 30
AE wgt = 30
critical time: 30

This tells us that this is an optimal time and this is an optimal schedule.



finishing time: 30min.
idle time: 5 min.
Observation: finishing time is 25 min faster w/ 2 processors!

Lesson: More processors does not necessarily shorten finishing time.

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2. Terminology

(a) **schedule** ordering of tasks that respects dependencies.

(b) **digraph** model of an event where • vertices are tasks. • vertices labeled with time • directed edge for v to w if w cannot start until v is completed

(c) **processors** people/machines/entities completing the tasks.

(d) **finishing time** time to complete all the tasks.

(e) **optimal finishing time and optimal schedule** the shortest finishing time and a schedule that achieves it.

(f) **idle time** total time when any processor is not working on a task.

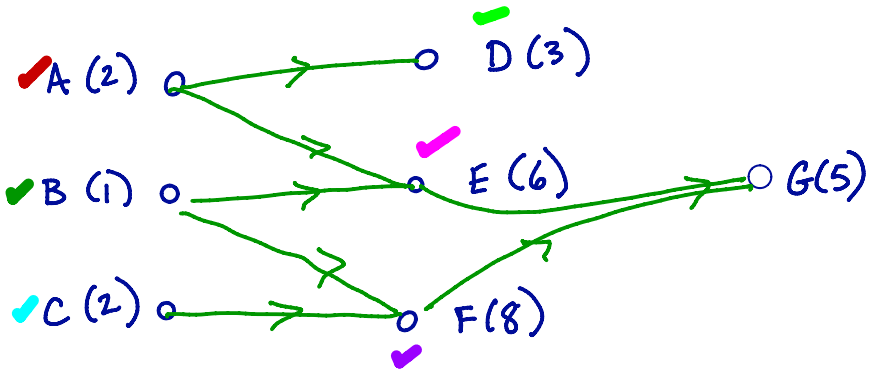
(g) **critical path** longest path in the digraph where length is the sum of vertex weights.

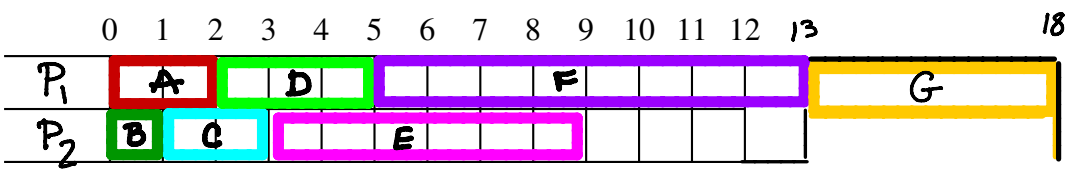
(h) critical time length of critical path. This is the minimum time to completion no matter how many processors are used.

3. **General Example**: Create a digraph. Make a valid schedule with TWO processors. Determine values of finishing time, idle time and critical time.

Finishing time 18
Idle: 9
Crit. path: CFG
Crit. time 15

label/task	time	dependence
A	2	
B	1	
C	2	
D	3	A
E	6	A,B
F	8	B,C
G	5	E,F





Can we do better??