Faculty of Computer Science & Information Technology
University of Malaya
Semester 1, 2016/2017 Academic Session

WIX2002: Project Management

Tutorial 4 - Answers

1. How does resource scheduling reduce flexibility in managing projects?

   Resource scheduling systems usually reduce flexibility because when resources are considered, computer routines use slack to get an "efficient" schedule. When slack is used up, flexibility is lost and the risk of delaying the project increases. If the resource conflict occurs on the critical path, the project is delayed.

2. Why scheduling resources is an important task? Give five reasons.

   The five reasons that explain why scheduling resources is an important task are, to:

   i. Check if existing resources are adequate and available;
   ii. Decide which resources have priority;
   iii. Assess the impact if another project is added to the pool;
   iv. Decide if an imposed project duration is realistic;
   v. Decide if outside contractors have to be used;

3. How does resource scheduling tie to project priority?

   Resource scheduling ties to project priority because resources are limited. The priority system ranks projects which then determines which project each resource should work on first.

4. Figure 1 shows a project network.

   a) Compute the early, late, and slack times. What is the project duration (in weeks)?

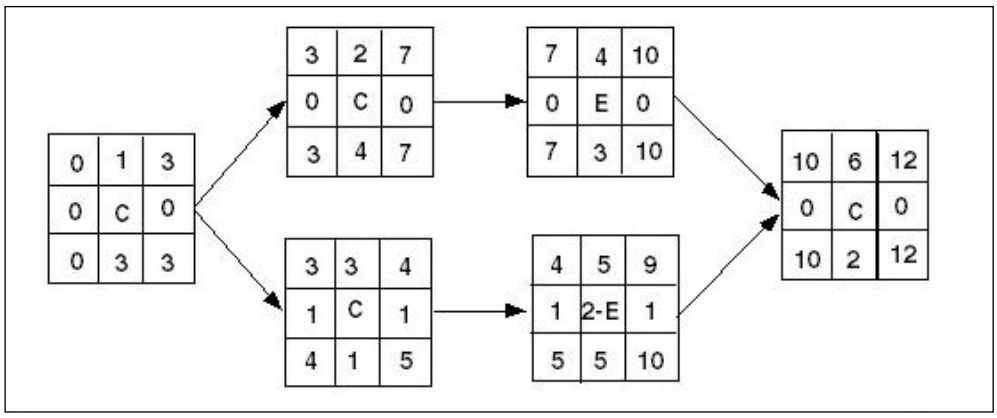


Figure 1: Project Network

The project duration now is 12 weeks.

b) Assume only one Carpenter, and two Electricians are available, respectively. Using Figure 2, develop a loading chart of resources for Carpenters (C), and Electricians (E).

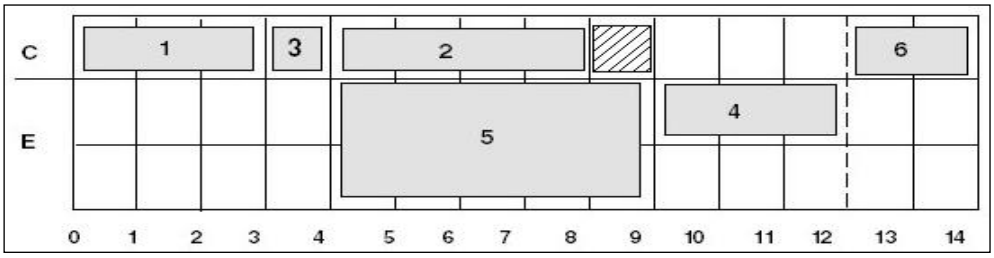
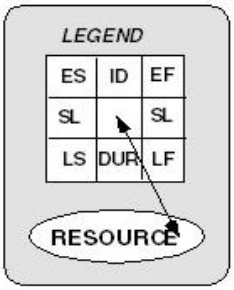


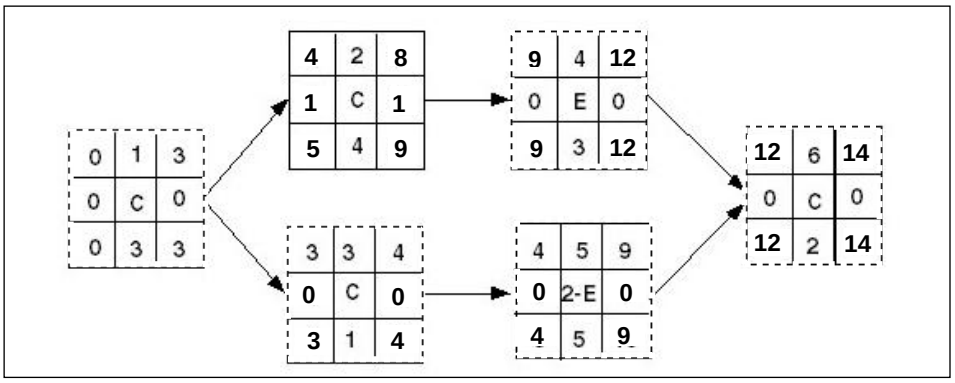
Figure 2: Loading Chart of Resources for C and E

c) Based on your answers given (part b), compute the early, late, and slack times for the project. Draw the latest project network. Which activities are now critical? What is the project duration now?

ID/RES	ES	LS	EF	LF	SLK
1-C	0	0	3	3	0
2-C	4	5	8	9	1
3-C	3	3	4	4	0
4-E	9	9	12	12	0
5-E	4	4	9	9	0
6-C	12	12	14	14	0



The latest project network diagram:



Activities that are now critical: 1, 3, 4, 5, and 6
The project duration now is 14 weeks.

5. Compute the early, late, and slack times for the activities as shown in Figure 3, assuming it is a time constrained network.

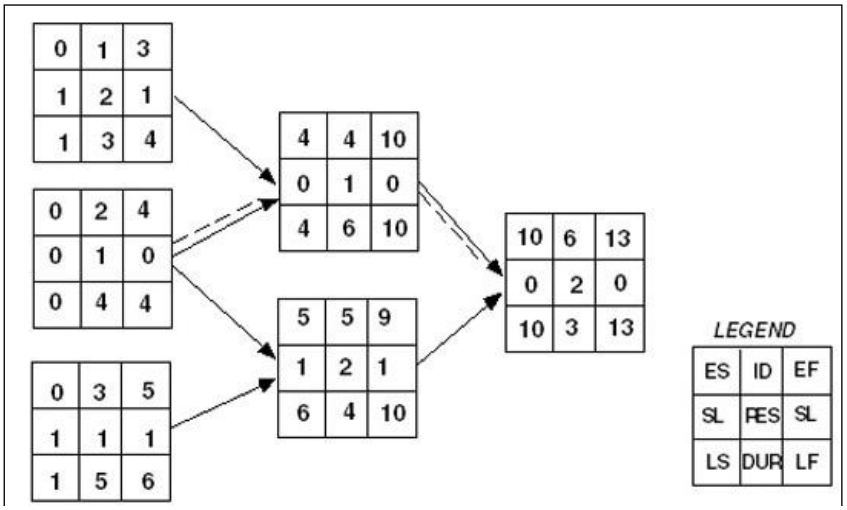


Figure 3: Project Network

a) Which activities are critical? What is the time constrained project duration with 3 maximum resource constraint?

Activities that are critical: 2, 4 and 6
Critical path: 2-4-6
The time constrained project duration is: 13 units (days/weeks/months)

b) Using the parallel method and the following heuristics priority rules:

Minimum slack
Smallest duration
Lowest identification number

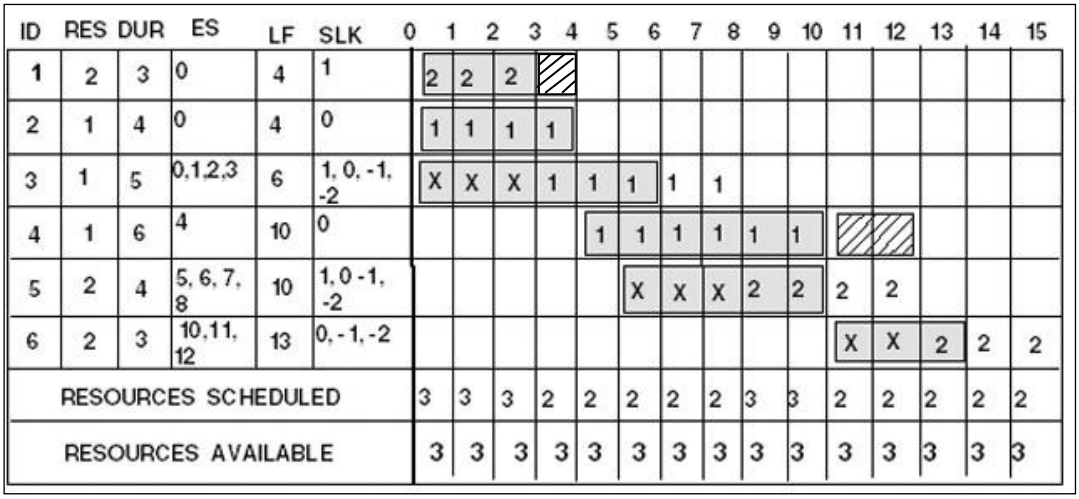
schedule the project only one period at a time. Keep a log of each activity change and the update that you make each period. Use the load chart to assist you in scheduling.

Log of Parallel Method of Scheduling:

Period	Activity	Changes
0-1	2	Schedule Activity 2 (first by minimum slack rule)
	1	Schedule Activity 1
	3	Delay Activity 3 ES to period 1. Reduce slack to 0
	5	Delay Activity 5 ES to period 6. Reduce slack to 0
1-2	3	Delay Activity 3 ES to period 2. Reduce slack to -1
	5	Delay Activity 5 ES to period 7. Reduce slack to -1
	6	Delay Activity 6 ES to period 11. Reduce slack to -1
2-3	3	Delay Activity 3 ES to period 2. Reduce slack to -2
	5	Delay Activity 5 ES to period 7. Reduce slack to -2
	6	Delay Activity 6 ES to period 12. Reduce slack to -2
3-4	3	Schedule Activity 3
4-5	4	Schedule Activity 4

5-6	__	No changes
6-7	__	No changes
7-8	__	No changes
8-9	5	Schedule Activity 5
9-10	__	No changes
10-11	__	No changes
11-12	__	No changes
12-13	6	Schedule Activity 6

Schedule resource load chart with ES and slack updates:



c) List the order in which you scheduled the activities of the project. Which activities of the project are now critical?

The order in which the activities of the project are scheduled: 2, 1, 3, 4, 5, 6

The activities of the project which are now critical: 2, 3, 5, 6

d) Based on your answers given (part c), re-compute the slack for each activity. What is the slack for activities: 1, 4 and 5?

The slack for activity 1: 1, activity 4: 2, activity 5: 0

6. What are the three most common problems associated with multi-project resource scheduling? Explain briefing, how can outsourcing the project work alleviate these problems?

The three most common problems associated with multi-project resource scheduling are: project slippage, utilisation of critical resources, and resource bottlenecks. For example, project delays can be avoided by contracting key activities when resources are not available internally. Likewise, hiring consultants to help with Y2K problems allows critical IT people to work on specific problems, while the outsiders work on standard programs. Not only does the project get done on time, but the company avoids hiring IT personnel to meet a short term need.

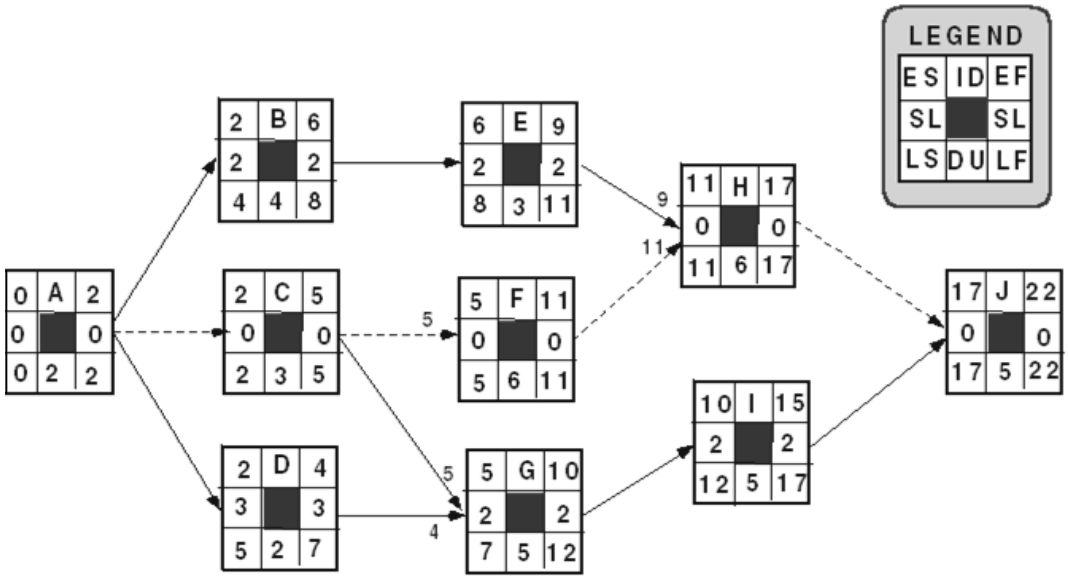
7. Why is scheduling overtime a popular choice for getting projects back on schedule? What are the potential problems for relying on this option?

   Scheduling overtime is a popular choice because it involves salary workers and no direct costs are added to the project. Even if it involves additional costs, the Brook's law is avoided and additional coordination and training costs are minimised. The potential problems are: additional time and costs associated with hourly overtime, and stress and fatigue that come with working long hours which can lead to accidents, inferior performance, and turnover.

8. Draw a project network from the following information.

ACTIVITY	PREDECESSOR	DURATION (WEEK)
A	None	2
B	A	4
C	A	3
D	A	2
E	B	3
F	C	6
G	C, D	5
H	E, F	6
I	G	5
J	H, I	5

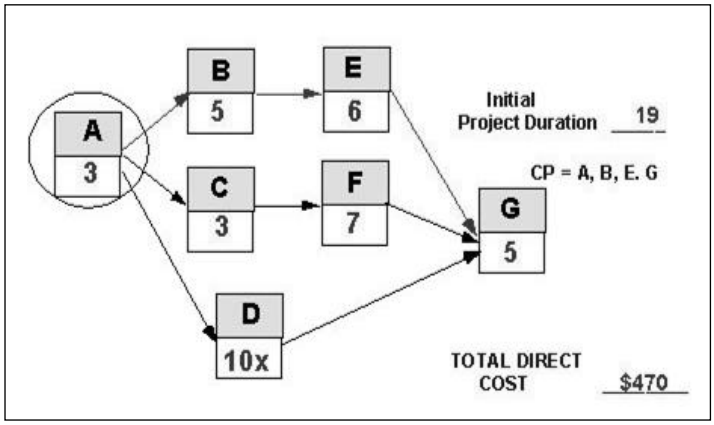
Activities B and C can be shortened to a minimum of 2 weeks.
Which activity would you shorten to reduce the project duration by 2 weeks? Why?

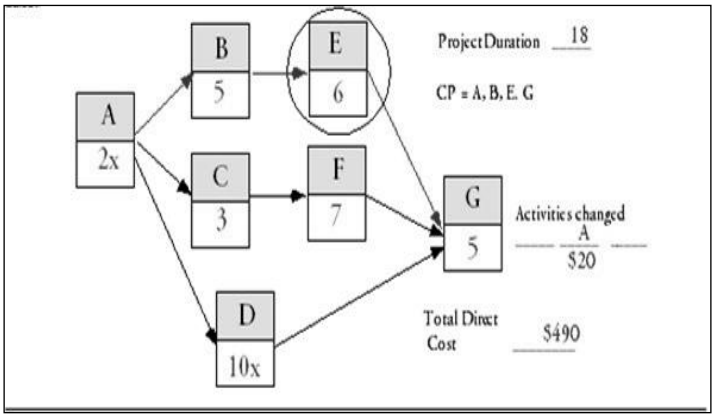


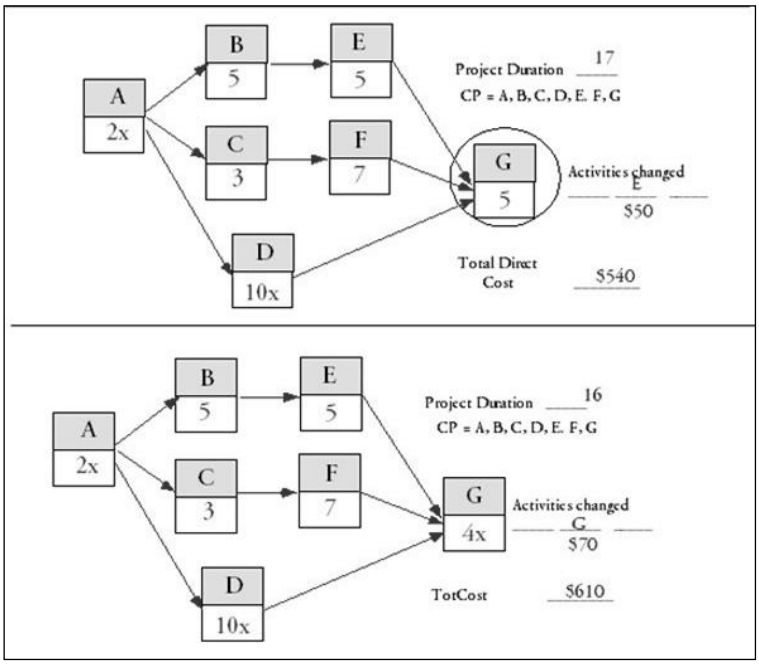
Activities A and J cannot be shortened. Activities B and C can be shortened to a minimum of 2 weeks. However, activity C would be shortened because it is on the critical path.

9. Assume the network and data that follow. Compute the total direct cost for each project duration. If the indirect costs for each project duration are $400 (19 time units), $350 (18), $300 (17), and $250 (16), compute the total project cost for each duration. Plot the total direct, indirect, and project costs for each of these durations on a cost-time graph. What is this cost? What is the optimum cost-time schedule for the project?

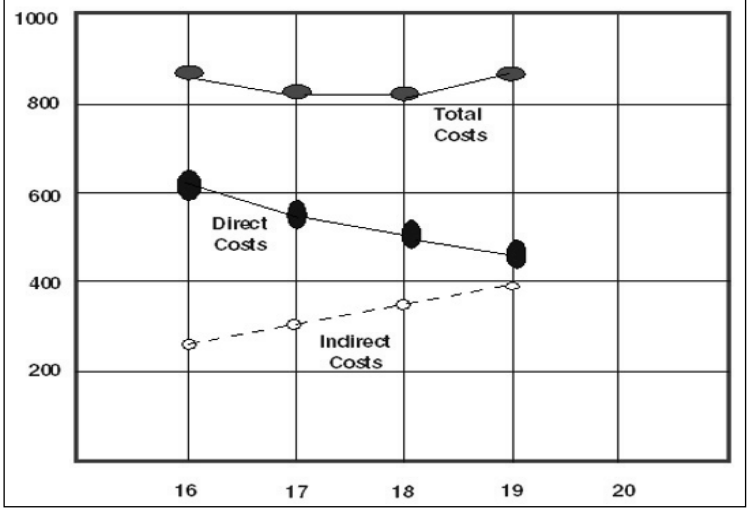
ACT.	NORMAL TIME	NORMAL COST	MAXIMUM CRASH TIME	CASH COST (per week)
A	3	50	1	20
B	5	60	2	60
C	3	70	1	40
D	10	50	0	0
E	6	100	3	50
F	7	90	3	100
G	5	50	1	70
		$470		







PROJECT DURATION	DIRECT COSTS	INDIRECT COSTS	TOTAL COSTS
19	470	400	870
18	490	350	840
17	540	300	840
16	610	250	860



The optimum cost-time schedule for the project is at 17th time unit at the cost of $840.

10. How can a cost-duration graph be used by the project manager? Explain.

A cost-duration graph is useful to the project manager for comparing alternatives. Any alternative that moves the project duration away from the optimum cost-duration point will increase costs. Additionally, incentives and penalties can be evaluated against the total, low cost point.