CE 167 Exam #2
Fall 2003
Prof. C.W. Ibbs

Directions:

- **Put your name on this exam.**
- **This exam is to be completed on these pages – answers not recorded in this exam will not be graded.**
- **Read the question thoroughly before answering. Point totals for each question are listed.**
- **Write legibly and express yourself logically. Write short, concise answers.**

Question #1 [30 points]

Using the data below, evaluate this project's earned value status as of the beginning of day 13 and the beginning of day 22. Depict the project status graphically. How is this project trending? Do you think the project will finish on budget? Discuss your analysis. All dates represent the beginning of the day.

Activity	Planned Dates		Total Cost	Budgeted Unit Cost
	Start	Finish		
A	1	12	$11,000	$1,000/day
B	8	18	$15,000	$1,500/day
C	10	25	$28,000	$2,000/day
D	12	28	$32,000	$2,000/day
Total	1	28	$86,000	

As of Beginning of Day 13:

Activity	Actual or Forecasted* Dates		Actual Cost Spent-to-Date	% Complete
	Start	Finish		
A	1	9	$8,000	100%
B	8	14*	$21,000	90%
C	12	26*	$20,000	50%
D	15*	28*	$0	0%
Total	1	28*	$49,000	

As of Beginning of Day 22:

Activity	Actual or Forecasted* Dates		Actual Cost Spent-to-Date	% Complete
	Start	Finish		
A	1	9	$8,000	100%
B	8	15	$22,000	100%
C	12	26*	$20,000	90%
D	15	27*	$26,000	80%
Total	1	27*	$76,000	

Solution

As of Beginning of Day 13:

Activity	BCWS	ACWP	BCWP	SV	CV
A	$11,000	$8,000	$11,000	$0	$3,000
B	$7,500	$21,000	$13,500	$6,000	-$7,500
C	$6,000	$20,000	$14,000	$8,000	-$6,000
D	$2,000	$0	$0	-$2,000	$0
Total	$26,500	$49,000	$38,500	$12,000	-$10,500

CPI_{13} = BCWP/ACWP = $38,500/$49,000 = 0.79 < 1 (over budget)

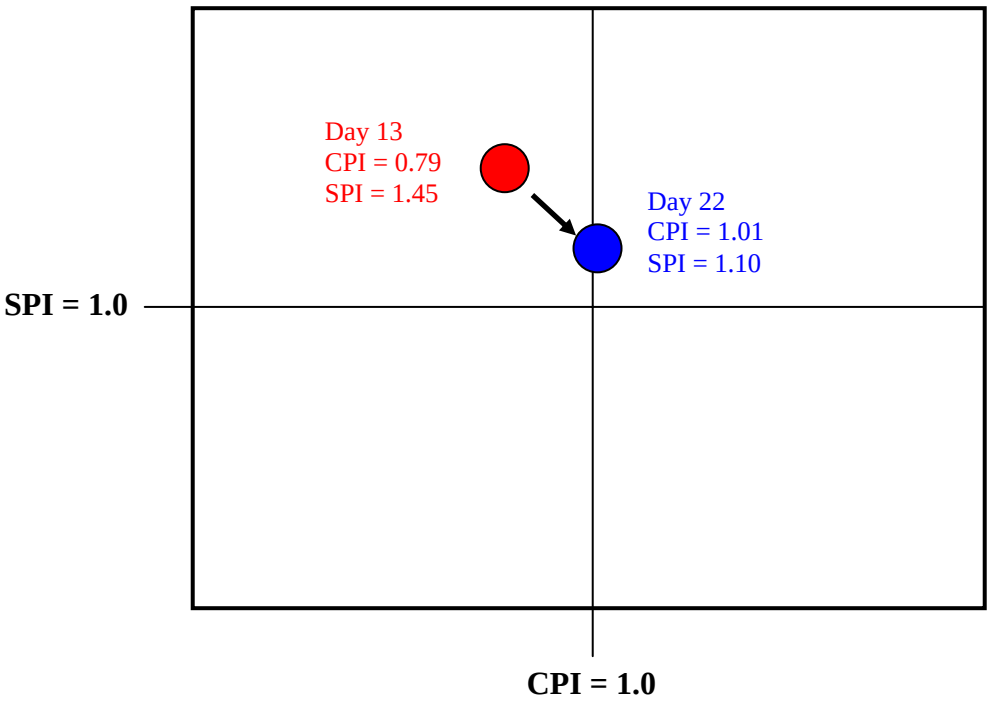
SPI_{13} = BCWP/BCWS = $38,500/$26,500 = 1.45 > 1 (ahead of schedule)

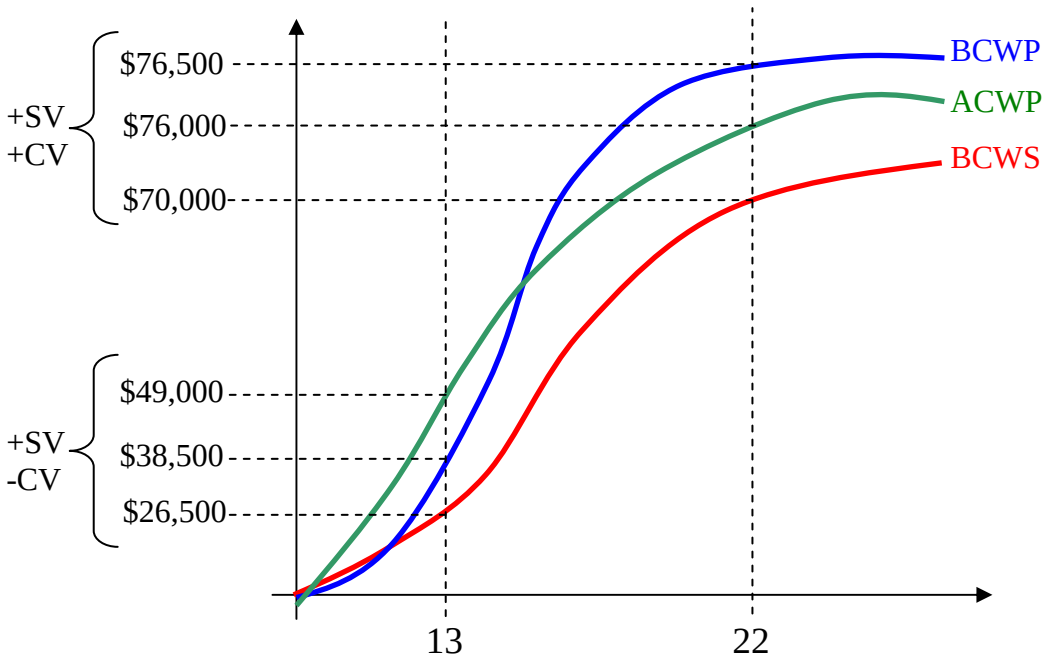
As of Beginning of Day 22:

Activity	BCWS	ACWP	BCWP	SV	CV
A	$11,000	$8,000	$11,000	$0	$3,000
B	$15,000	$22,000	$15,000	$0	-$7,000
C	$24,000	$20,000	$25,200	$1,200	$5,200
D	$20,000	$26,000	$25,600	$5,600	-$400
Total	$70,000	$76,000	$76,800	$16,800	$800

CPI_{22} = $BCWP_{22}/ACWP_{22}$ = $76,800/$76,000 = 1.01 (approx. on budget)

SPI_{22} = ($BCWP_{25}$/ $BCWS_{22}$) $76,800/$70,000 = 1.10 (slightly ahead of schedule)





The project goes from being overbudget but ahead of schedule to being approximately on budget and on schedule. The corrections made after Day 13 (as represented by the provided data) have pulled the project back into line. If the most recent trends hold, the project will be completed on budget.

Question #2 [30 points total – 15 points for each part]

a) For the following activities, find the early start, early finish, late start, late finish, total float and free float. Record your answers neatly in a table. Determine which activities are critical.

Activity	Predecessor	Duration
A	--	2
B	A	4
C	A	5
D	A	6
E	D	2
F	B, C	5
G	E	6
H	E	1
I	F, G, H	2

b) Perform the same calculations as above, but add a finish-to-finish constraint of 10 (FF10) between Activities B and F, a start-to-start constraint of 4 (SS4) between Activities C and F, and a finish-to-start constraint of 2 (FS2) between activities E and H. Record your answers in a separate table. Do the two schedules differ, and if so, how? Be specific.

Question #3 [10 points]

What is a cardinal change? Why are cardinal changes illegal in public works projects? Can a contractor be properly forced to perform a cardinal change in private work?

According to Bartholomew (p. 208):

- A cardinal change is a change to the contract that, because of its size or the nature of the changed work, is clearly beyond the general scope of the contract. It is beyond the reasonable contemplation of the owner and contractor at the time of contract formation. (4 points)
- Additive cardinal changes are illegal on public contracts, even if the owner and contractor agree to the change, because such a large addition of work violates public bidding statutes guaranteeing free and open competition. (3 points)
- Regarding private work, cardinal changes are not illegal and not improper if both the owner and contractor agree to the change. However, a cardinal change cannot be forced upon the contractor. (3 points)

Question #4 [5 points]

What is force account?

According to Bartholomew (p. 210):

Force account is a particular form of retrospective pricing in which the contract spells out a specific procedure for arriving at the price adjustment when the contractor and owner fail to agree on the price by forward pricing (forward pricing is when the owner and contractor agree on the price and time requirement for a change or additional work before starting the work required by the change).

Question #5 [10 points]

Briefly define and give an example of Type I and Type II differing site conditions (DSC).

- Type I DSC refer to a physical condition encountered in the work of contract that differs materially from the conditions indicated in the contract documents. Examples include encountering different soils of water table elevating as those indicated in soil boring logs or finding adverse site conditions, such as bogs or creeks, not indicated on any site plans.
- Type II DSCs are physical conditions that differ materially from conditions normally expected in the type of construction work in the contract involved. Examples include soil and rock that, while correctly identified on boring logs, impedes construction by prematurely wearing out construction tools, like ripper teeth or tunnel boring machine cutter disks.

Question #6 [5 points]

List the five levels of Maslow's Hierarch of Needs.

From lowest to highest:

- Physiological
- Safety
- Love
- Esteem
- Self-Actualization