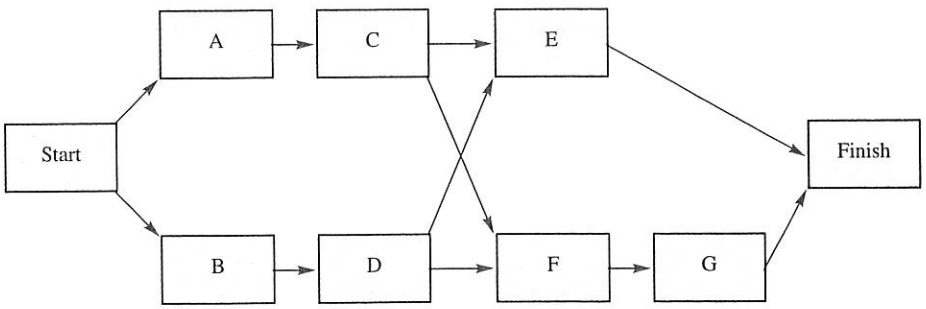
20. Return to the computer installation project in Problem 7 and assume that the project has to be completed in 16 weeks. Crashing of the project is necessary. Use the following relevant information.

	Time (weeks)		Cost ($)	
Activity	Normal	Crash	Normal	Crash
A	3	1	900	1700
B	6	3	2000	4000
C	2	1	500	1000
D	5	3	1800	2400
E	4	3	1500	1850
F	3	1	3000	3900
G	9	4	8000	9800
H	3	2	1000	2000

a. Formulate a linear programming model that can be used to make the crashing decisions for this project.
b. Solve the linear programming model and make the minimum cost crashing decisions. What is the added cost of meeting the 16-week completion time?
c. Develop a complete activity schedule based on the crashed activity times.

21. Consider the following project network and activity times (in days).

SELF test



Activity	A	B	C	D	E	F	G
Time	3	2	5	5	6	2	2

The crashing data for this project are as follows.

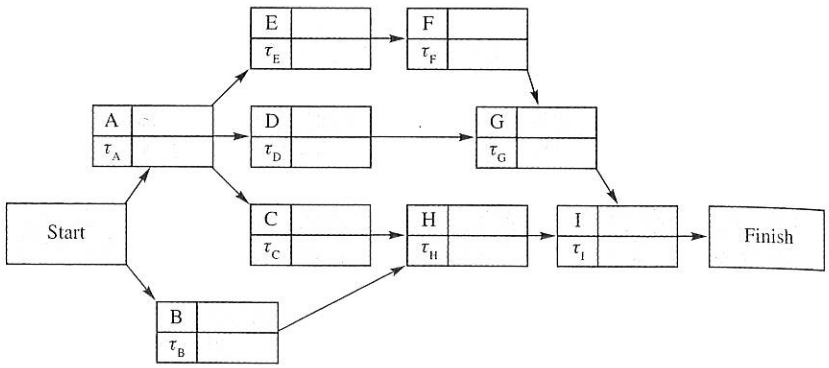
	Time (days)		Cost ($)	
Activity	Normal	Crash	Normal	Crash
A	3	2	800	1400
B	2	1	1200	1900
C	5	3	2000	2800
D	5	3	1500	2300
E	6	4	1800	2800
F	2	1	600	1000
G	2	1	500	1000

a. Find the critical path and the expected project completion time.
b. What is the total project cost using the normal times?

SELF test

22. Refer to Problem 21. Assume that management desires a 12-day project completion time.
a. Formulate a linear programming model that can be used to assist with the crashing decisions.
b. What activities should be crashed?
c. What is the total project cost for the 12-day completion time?

23. Consider the following project network. Note that the normal or expected activity times are denoted τ_i, i = A, B, . . . , I. Let x_i = the earliest finish time for activity i. Formulate a linear programming model that can be used to determine the length of the critical path.



24. Office Automation, Inc., developed a proposal for introducing a new computerized office system that will improve word processing and interoffice communications for a particular company. Contained in the proposal is a list of activities that must be accomplished to complete the new office system project. Use the following relevant information about the activities.

Activity	Description	Immediate Predecessor	Time (weeks)		Cost ($1000s)	
			Normal	Crash	Normal	Crash
A	Plan needs	—	10	8	30	70
B	Order equipment	A	8	6	120	150
C	Install equipment	B	10	7	100	160
D	Set up training lab	A	7	6	40	50
E	Conduct training course	D	10	8	50	75
F	Test system	C, E	3	3	60	—

a. Develop a project network.
b. Develop an activity schedule.
c. What are the critical activities, and what is the expected project completion time?
d. Assume that the company wants to complete the project in six months or 26 weeks. What crashing decisions do you recommend to meet the desired completion time at the least possible cost? Work through the network and attempt to make the crashing decisions by inspection.
e. Develop an activity schedule for the crashed project.
f. What added project cost is required to meet the six-month completion time?