Internet Homework Problems

See our Internet home page, at **www.pearsonhighered.com/render**, for additional homework problems, Problems 12–33 to 12–40.

Case Study

Southwestern University Stadium Construction

After six months of study, much political arm wrestling, and some serious financial analysis, Dr. Martin Starr, president of Southwestern University, had reached a decision. To the delight of its students, and to the disappointment of its athletic boosters, SWU would not be relocating to a new football site but would expand the capacity at its on-campus stadium.

Adding 21,000 seats, including dozens of luxury skyboxes, would not please everyone. The influential football coach, Bo Pitterno, had long argued the need for a first-class stadium, one with built-in dormitory rooms for his players and a palatial office appropriate for the coach of a future NCAA champion team. But the decision was made, and *everyone*, including the coach, would learn to live with it.

The job now was to get construction going immediately after the current season ended. This would allow exactly 270 days until the upcoming season opening game. The contractor, Hill Construction (Bob Hill being an alumnus, of course), signed the contract. Bob Hill looked at the tasks his engineers had outlined and looked President Starr in the eye. "I guarantee the team will be able to take the field on schedule next year," he said with a sense of confidence. "I sure hope so," replied Starr. "The contract penalty of $10,000 per day for running late is nothir compared to what Coach Pitterno will do to you if our openir game with Penn State is delayed or cancelled." Hill, sweatir slightly, did not respond. In football-crazy Texas, Hill Construction would be *mud* if the 270-day target were missed.

Back in his office, Hill again reviewed the data. (Se Table 12.11 and note that optimistic time estimates can b used as crash times.) He then gathered his foremen. "Peopl if we're not 75% sure we'll finish this stadium in less than 27 days, I want this project crashed! Give me the cost figures fo a target date of 250 days—also for 240 days. I want to b *early*, not just on time!"

Discussion Questions

1. Develop a network drawing for Hill Construction and determine the critical path. How long is the project expected to take?
2. What is the probability of finishing in 270 days?
3. If it were necessary to crash to 250 or 240 days, how would Hill do so, and at what costs? As noted in the case, assume that optimistic time estimates can be used as crash times.

Case Study

Family Planning Research Center of Nigeria

Dr. Adinombe Watage, deputy director of the Family Planning Research Center in Nigeria's Over-the-River Province, was assigned the task of organizing and training five teams of field workers to perform educational and outreach activities as part of a large project to demonstrate acceptance of a new method of birth control. These workers already had training in family planning education but must receive specific training regarding the new method of contraception. Two types of materials must also be prepared: (1) those for use in training the workers, and (2) those for distribution in the field. Training faculty must be brought in and arrangements made for transportation and accommodations for the participants.

Dr. Watage first called a meeting of his office staff. Together they identified the activities that must be carried out, their necessary sequences, and the time that they would require. Their results are displayed in Table 12.12.

Louis Odaga, the chief clerk, noted that the project had to b completed in 60 days. Whipping out his solar-powered calculator, he added up the time needed. It came to 94 days. "An impossible task, then," he noted. "No," Dr. Watage replied, "some o these tasks can go forward in parallel." "Be careful, though," warned Mr. Oglagadu, the chief nurse, "there aren't that many o us to go around. There are only 10 of us in this office."

"I can check whether we have enough heads and hands once I have tentatively scheduled the activities," Dr. Watage responded. "If the schedule is too tight, I have permission from the Pathminder Fund to spend some funds to speed it up, just so long as I can prove that it can be done at the least cost necessary. Can you help me prove that? Here are the costs for the activities with the elapsed time that we planned and the costs and times if we shorten them to an absolute minimum." Those data are given in Table 12.13.

Case Study

Southwestern University Traffic Problems

Southwestern University (SWU), located in the small town of Stephenville, Texas, is experiencing increased interest in its football program now that a big-name coach has been hired. The increase in season ticket sales for the upcoming season means additional revenues, but it also means increased complaints due to the traffic problems associated with the football games. When a new stadium is built, this will only get worse. Marty Starr, SWU's president, has asked the University Planning Committee to look into this problem.

Based on traffic projections, Dr. Starr would like to have sufficient capacity so that 35,000 cars per hour could travel from the stadium to the interstate highway. To alleviate the anticipated traffic problems, some of the current streets leading from the university to the interstate highway are being considered for widening to increase the capacity. The current street capacities with the number of cars (in 1,000s) per hour are shown in Figure 11.34. Since the major problem will be after the game, only the flows away from the stadium are indicated. These flows include some streets closest to the stadium being transformed into one-way streets for a short period after each game with police officers directing traffic.

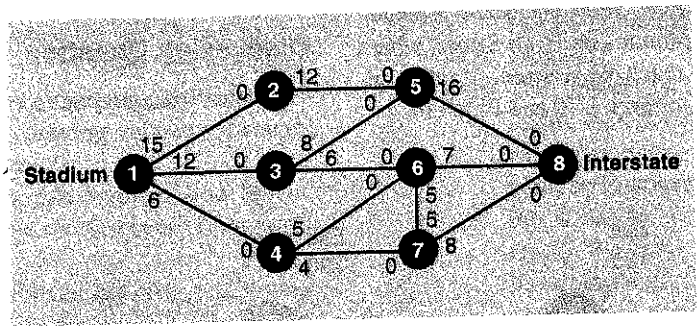
Alexander Lee, a member of the University Planning Committee, has said that a quick check of the road capacities in the diagram in Figure 11.34 indicates that the total number of cars per hour that may leave the stadium (node 1) is 33,000. The number of cars that may pass through nodes 2, 3, and 4 is 35,000 per hour, and the number of cars that may pass through nodes 5, 6, and 7 is even greater. Therefore, Dr. Lee has suggested that the current capacity is 33,000 cars per hour. He has also suggested that a recommendation be made to the city manager for expansion of one of the routes from the stadium to the highway to permit an additional 2,000 cars per hour. He recommends expanding whichever route is cheapest. If the city chooses not to expand the roads, it is felt that the traffic problem would be a nuisance but would be manageable.

Based on past experience, it is believed that as long as the street capacity is within 2,500 cars per hour of the number that leave the stadium, the problem is not too severe. However, the severity of the problem grows dramatically for each additional 1,000 cars that are added to the streets.

Discussion Questions

1. If there is no expansion, what is the maximum number of cars that may actually travel from the stadium to the interstate per hour? Why is this number not equal to 33,000, as Dr. Lee suggested?
2. If the cost for expanding a street were the same for each street, which street(s) would you recommend expanding to increase the capacity to 33,000? Which streets would you recommend expanding to get the total capacity of the system to 35,000 per hour?

FIGURE 11.34
Roads from Stadium to interstate



Internet Case Study

See our Internet home page, at **www.pearsonhighered.com/render**, for the additional case study Ranch Development Project, which involves finding the least-cost way to provide water and sewer services to homes in a new housing development.