

Prince of Songkla University

Faculty of Engineering

Final Examination: Semester I

Academic Year: 2004

Date: October 4, 2004

Time: 13.30-16.30 hr.

Subject: 220-574 Mathematical and Statistical Methodologies for

Room: R300

Transportation Studies

คำสั่งในการทำข้อสอบ

1. ข้อสอบชุดนี้มีคำถามทั้งหมด 4 ข้อ คะแนนเท่ากันทุกข้อ ให้ตอบทุกคำถาม
2. อนุญาตให้นำเอกสาร ตำรา และอุปกรณ์การคำนวณเข้าห้องสอบได้

1. Figure 1 gives the mileage of the feasible links connecting nine offshore natural gas wellheads with an inshore delivery point. Because the location of wellhead 1 is the closest to shore, it is equipped with sufficient pumping and storage capacity to pump the output of the remaining eight wells to the delivery point. Determine the minimum pipeline network that links the wellheads to the delivery point.

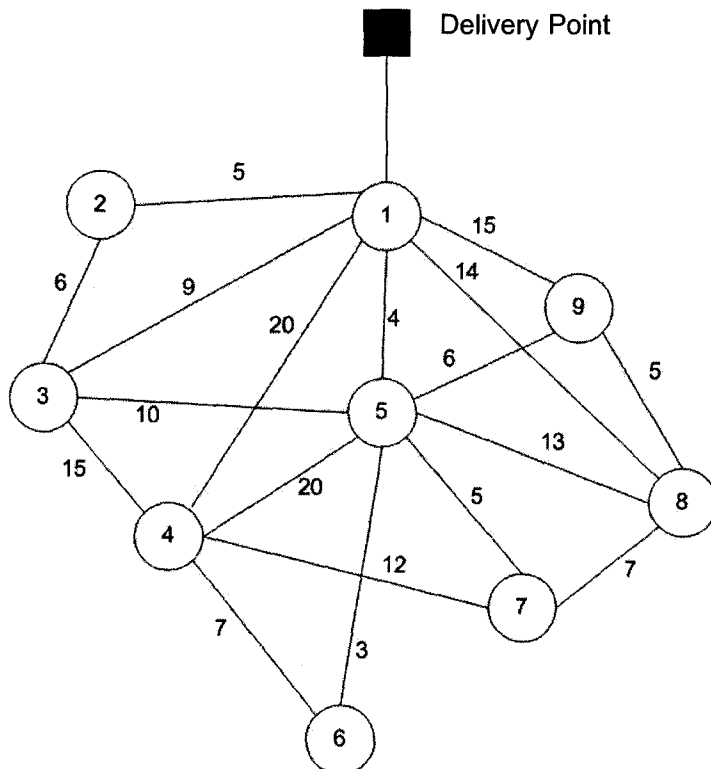


Figure 1
Network for Problem 1

In Figure 1 above, suppose that the wellheads can be divided into two groups depending on gas pressure: a high-pressure group that includes well 2, 3, 4, and 6; and a low-pressure group that includes wells 5, 7, 8, and 9. Because of pressure difference, well-heads from the two groups cannot be linked. At the same time, both groups must be connected to delivery point through wellhead 1. Determine the minimum pipeline network for this situation.

2. Sunray Electric Co-Op uses a fleet of 20 trucks to service its electric network. The company wants to develop a periodic preventive maintenance for the fleet. The probability of a breakdown in year 1 is zero. For period 2, the breakdown probability is 0.03, and it increases annually in 0.01 for years 3 through 10. Beyond year 10, the breakdown probability is constant at 0.13. A random breakdown costs \$200 per truck, and a scheduled maintenance costs only \$75 per truck. Sunray wants to determine the optimal period (in months) between scheduled preventive maintenances.

- (a) Develop the associated decision tree.
 (b) Determine the optimal maintenance cycle length.

3. The following table gives the activities for buying a new car. Construct the project network.

Activity	Predecessor(s)	Duration (days)
A. Conduct feasibility study	-	3
B. Find potential buyer for present car.	A	12
C. List possible models	A	1
D. Research all possible models	C	3
E. Conduct interview with mechanic	C	1
F. Collect dealer propaganda	C	2
G. Compile pertinent data	D,E,F	1
H. Choose top three models	G	4
I. Test drive all three choices	H	3
J. Gather warranty and financing data	H	2
K. Choose one car	I,J	5
L. Choose dealer	K	2
M. Search for desired color and options	L	4
N. Test-drive chosen model once again	L	1
O. Purchase new car	B,M,N	3

And determine the critical path for the project.

4. The owner of a newspaper stand receive 65 copies of Thairath newspaper every morning. The daily demand, x , varies randomly according to the following probability distribution:

$$p(x) = 1/50 \text{ for } x = 55, 56, 57, \dots, 59$$

$$= 1/25 \text{ for } x = 60, 61, 62, \dots, 69$$

$$= 1/30 \text{ for } x = 70, 76, 77, \dots, 84$$

- (a) Determine the probability that the owner will sell out completely
 (b) Determine the expected number of unsold copies per day
 (c) If the owner pays 5 baht a copy and sells it for 8 baht, determine the owner's expected net income per day.