國立台灣科技大學九十五學年度碩士班招生試題

系所組別： 工業管理系碩士班甲組

科　　目： 作業研究

注意事項：

1. 本試題共【4】題，配分共 100 分。請按順序標明題號作答，不必抄題。
2. 全部答案均須答在答案卷之答案欄內，否則不予計分。Show all your calculations。

1. Use the two-phase simplex method to solve (20%):

Minimize: $Z = -3x_1 + x_2 + x_3$

Subject to:

$$x_1 - 2x_2 + x_3 \le 11$$
$$-4x_1 + x_2 + 2x_3 \ge 3$$
$$2x_1 - x_3 = -1$$
$$x_1, x_2, x_3 \ge 0$$

2. Consider the transportation problem having the following parameter table:

		Destination						Supply
		1	2	3	4	5	6	
Source	1	15	12	24	30	20	0	6
	2	14	12	18	22	M	0	8
	3	5	0	M	10	8	0	9
	4	18	8	20	24	14	0	5
	5	30	25	35	38	30	0	4
Demand		3	6	4	6	7	2	

Use each of the following criteria to obtain an initial BF solution. Compare the values of the objective function for these solutions. a) Northwest corner rule. (10%); b) Vogel's approximation method. (10%); c) Russell's approximation method. (10%)

3. The management of a company is considering three possible new products for next year's product line. A decision now needs to be made regarding which products to market and at what production levels. Initiating the production of two of these products would require a substantial start-up cost, as shown in the first row of the table below. Once production is under way, the marginal net revenue from each unit produced is shown in the second row. The third row gives the percentage of the available production capacity that would be used for each unit produced.

	Product		
	1	2	3
Start-up cost, $\$c_n$	3	2	0
Marginal net revenue, r_n	2	3	1
Capacity used per unit, %	20	40	20

Only 3 units of product 1 could be sold, whereas all units that could be produced of the other two products could be sold. The objective is to determine the number of units of each product to produce in order to maximize the total profit (total net revenue minus start-up costs). Assuming that production quantities must be integers, use dynamic programming to solve this problem (25%).

4. Customers arrive at a fast food restaurant with one server according to a Poisson process at a mean rate of 30 per hour. The server has just resigned, and the two candidates for the replacement are X (fast but expensive) and Y (slow but inexpensive). Both candidates would have an exponential distribution for service times with X having a mean of 1.2 minutes and Y having a mean of 1.5 minutes. Restaurant revenue per month is given by \$6,000/W where W is the expected waiting time (in minutes) of a customer in the system. Determine the upper bound on the difference in their monthly compensations that would justify hiring X rather than Y (25%).