元智大學 103 學年度研究所 **碩士班** 招生試題卷

系(所)別：工業工程與管理學系碩士班　組別：不分組　科目：作業研究　用紙第 1 頁共 1 頁

●不可使用電子計算機

1. (30%) Consider the following linear programming problem
   Maximize $Z = 4X_1 + 3X_2 + 6X_3$
   Subject to $3X_1 + X_2 + 3X_3 \le 30$
   $2X_1 + 2X_2 + 3X_3 \le 40$
   $X_1 \ge 0,\ X_2 \ge 0,\ X_3 \ge 0$
   (a) Solve this problem with simplex method. (20%)
   (b) Write the dual problem. (5%)
   (c) Find the dual optimal solution from your result in (a). (5%)

2. (20%) Use dynamic programming technique to solve the following linear programming problem
   Maximize $Z = 4X_1 + 6X_2$
   Subject to $2X_1 + X_2 \le 6$
   $X_1 + 3X_2 \le 8$
   $X_1 \ge 0, X_2 \ge 0$

3. (20%) Consider the following transportation problem with a basic feasible solution as follows: $X_{11} = 30, X_{23} = 35, X_{24} = 15, X_{31} = 10, X_{32} = 30, X_{34} = 5$

13	14	11	15	30
30				
15	13	12	11	50
		35	15	
10	9	13	11	45
10	30		5	
40	30	35	20	

   (a) Is this feasible solution optimal? If not, apply the transportation simplex method to find an optimal feasible solution. (10%)
   (b) What is the range of C_{31} (currently 10) such that the optimal solution you obtained remains unchanged? (10%)

4. (30%) A maintenance person has he job of keeping two machines in working order. The amount of time that a machine works before breaking down has an exponential distribution with a mean of 10 hours. The time then spent by the maintenance person to repair the machine has an exponential distribution with a mean of 8 hours.
   (a) Draw a balance diagram for the queueing system, where the state "n" denotes the number of the machines under repair, $n = 0, 1, 2$. (5%)
   (b) What is the run long fraction of time that there is one machine in the repairing system? (10%)
   (c) Calculate L, L_q, and W_q for the repairing system, where L is the average number of machines in the repairing system, L_q is the average number of machines in the queue, and W_q is the average waiting in the queue. (10%)
   (d) Determine the fraction of time that the maintenance person is busy. (5%)

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