國立臺北科技大學

九十三學年度工業工程與管理系碩士班入學考試

作業研究試題

填准考證號碼

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

一.Which of the following questions is TRUE or FALSE, Just your answers.(30%)

(1) Every Linear Programming problem has an optimal solution.
(2) In the Simplex method, all variables must be negative.
(3) The M-method and two-phase method require the same number of iterations for solving a Linear Programming problem.
(4) When both primal and dual have the same objective function values, they both reach optimality.
(5) If the primal is infeasible, the dual always has unbounded optimum.
(6) Every basic solution in the assignment problem is necessarily degenerate.
(7) A critical activity must have its total and free float equal to zero.
(8) If we increase the holding cost, then the Economic Order Quantity will be increased.
(9) Using forward recursion and backward recursion for a same Dynamic Programming, may obtain different optimal solutions.
(10) If the slack variable associated with a resource is positive, the unit worth of the resource may not equal zero.

二 Consider the following problem. (15%)

Maximize $Z = 4X_1 + 5X_2 + 3X_3$

Subject to

$$X_1 + X_2 + 2X_3 \geqq 20$$

$$5X_1 + 6X_2 - 5X_3 \leqq 50$$

$$X_1 + 3X_2 + 5X_3 \leqq 30$$

And $X_1 \geqq 0,\ X_2 \geqq 0,\ X_3 \geqq 0$

Find the optimal solution by using simplex method.

三 The following tableau gives an optimal solution to a linear programming problem(15%)

Basis	X_1	X_2	X_3	X_4	X_5	X_6	X_7	b
X_2	0	1	0	7	0	-1	2	10
X_1	1	0	0	-4	1	1	-2	40
X_3	0	0	1	1	-1	0	1	30
C	0	0	0	7	3	1	1	380

Assume $(X_5, X_6, X_7)$was the initial slack variables.

(1) If we insist on the requirement that $X_3 = 25$, does the problem have any feasible solution?

(2) Suppose that the right hand side of the original problem is increased by $[5,5,5]^T$. Dees the original optimal solution change? If it does, find the new optimal solution.

四 Consider a supermarket that wants to study its sales of bread, suppose that the factory delivers one loaf of bread to this supermarket every day before that supermarket is open and the supermarket will sell these bread on the first-in-first-out basis, that is, it always sells the oldest bread first upon demands.

Suppose that each customer will buy exactly one loaf of bread and let the number of customers for buying the bread on any day denoted by D with probability $P(D=d)=c\frac{2^d}{d!}$ d=1, 2, 3, 4

Any bread will be discarded after 4 days in store. Let the state be the number of loaves in this supermarket when it is closed every day.

(1) Find the value of c.

(2) Identify the possible states of Markov chain and construct the one-step transition matrix.

(3) Does the limiting probabilities exist? Explain your reason. (20%)

五 A three teller bank is experiencing long queues during certain peak periods. A study has shown that customer service takes an average of 3 minutes and follows the exponential distribution. An average of 45 customers per hour arrive at the bank and randomly join one of the three individual teller queues.

(1) On the average how long are the customers waiting in the queues and how many customers are waiting for service?

(2) How would the average queueing time and queue length change if a single (pooled) queue strategy were implemented? (20%)