國立勤益技術學院九十五學年度研究所一般招生筆試試題卷

所別：　生產系統工程與管理研究所　　組別：

科目：　作業研究

准考證號碼：□□□□□□□□（考生自填）

考生注意事項：

一、考試時間 100 分鐘

試題一：**LP Simplex.**〈Each 4 points, total 20 points〉

Consider the following LP model:

Maximize　$5x_1 + 2x_2 + 3x_3$

subject to　$x_1 + 5x_2 + 2x_3 \le$ ____

$x_1 - 5x_2 - 6x_3 \le$ ____

$x_1, x_2, x_3 \ge 0$

Given the following optimal tableau, fill the blanks above and below.

Basic	x_1	x_2	x_3	x_4	x_5	RHS
Z	0	____	7	____	0	150
x_1	1	5	2	1	0	30
x_5	0	____	-8	-1	1	10

試題二：**LP Duality.**〈Each 5 points, total 15 points〉

Consider the following **primal** LP problem:

Maximize　$z = 60x_1 + 30x_2 + 20x_3$

Subject to　$8x_1 + 6x_2 + x_3 \le 48$

$4x_1 + 2x_2 + 1.5x_3 \le 20$

$2x_1 + 1.5x_2 + 0.5x_3 \le 8$

$x_1, x_2, x_3 \ge 0$

and the **dual** is

Minimize　$w = 48y_1 + 20y_2 + 8y_3$

Subject to　$8y_1 + 4y_2 + 2y_3 \ge 60$

$6y_1 + 2y_2 + 1.5y_3 \ge 30$

$y_1 + 1.5y_2 + 0.5y_3 \ge 20$

$y_1, y_2, y_3 \ge 0$

Given the optimal solution to the primal problem is $z = 280$, $x_1 = 2$, $x_2 = 0$, $x_3 = 8$, use *complementary slackness* property to solve the dual problem, i.e., $y_1 =$ _____, $y_2 =$ _____, $y_3 =$ _____.

試題三：**Integer Programming Model Formulation.** 〈 15 points〉

The NCIT is to form a committee to handle the students' complaints. The committee must include at least one female, one male, one student, and one faculty. Eight individuals (identified by the letters a to h) have been nominated. The mix of these individuals in the different categories is given as:

Category	Individuals
Females	a, b, c, d
Males	e, f, g, h
Students	$b, c, f,$
Faculty	a, d, e, g, h

Formulate this problem as an integer linear program.

試題四：**Queueing Problem.** 〈 25 points〉

Consider a queuing system involving a single service center. The interarrival times between successive customers form a sequence of identically and independently distributed random variables having the exponential distribution

$\varphi_T(x) = \lambda e^{-\lambda x}, \quad \lambda > 0, \quad 0 < x < \infty,$

The service time for each successive customer form a sequence of identically and independently distributed random variables having the exponential distribution

$\varphi_S(x) = \mu e^{-\mu x} \quad \mu > 0, \quad 0 < x < \infty,$

a. Define the traffic intensity $\rho = \frac{\lambda}{\mu}$. Determine the maximum allowable traffic intensity in the M/M/1 queuing system so that the equilibrium probability of having customers in excess of some specified number a in the system will be less than or equal to a given level α.
b. Determine the probability that a traffic intensity of $\rho = 0.525$ will generate more than 5 customers in the system.
c. Determine the corresponding average number of customers in the system.

試題五：**Dynamic Programming.** 〈 25 points〉

We are given a T = 3 period inventory problem with fixed order cost K = 5, and c = 3 per unit, h = 0.3 per unit per period. The demands over the three successive periods are: d(1) = 4, d(2) = 1, d(3) = 2.

Solve this problem with dynamic programming approach to the find the best order policy for each time period.