1. Consider this problem:

max. $x_0=2x_1+x_2+5x_3+6x_4$

s.t. $2x_1+x_3+x_4 \leq 8$

$2x_1+2x_2+x_3+3x_4 \leq 12$

$x_1, x_2, x_3, x_4 \geq 0$

If x_3, x_4 constitute a basic solution, use primal-dual relationships to find out (1) the corresponding dual solution (2) is the solution optimal or not? DO NOT USE SIMPLEX TABLEAU. (20%)

2. Solve the following problem by the dynamic programming backward recursive equation:

max. $z=2x_1+3x_2+4x_3$

s.t. $2x_1+2x_2+3x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$ and integers. (20%)

3. Consider the LP problem in standard form

min. C^TX

s.t. $AX=b$

$X \geq 0$

Suppose that the A matrix has the special "block-angular" structure:

$$A=\begin{pmatrix} D_1 & D_2 & \cdots & D_N \\ A_1 & & & \\ & A_2 & & \\ & & \ddots & \\ & & & A_N \end{pmatrix}$$

Please convert the LP problem to an equivalent master problem by using decomposition algorithm. (20%)

4. Two employees, Lin and Wen, of a fast-food restaurant play the following game while waiting for customers to arrive. Wen pays Lin 1 cent if the next customer does not arrive within 1 minute; otherwise, Lin pays Wen 1 cent. Determine Wen's expected gain in an 8-hour period assuming that the customers arrive according to a Poisson distribution with mean rate one per minute.(20%)

5. Assume that there are two weighted coins. Coin 1 has a probability of 0.25 of turning up heads, and coin 2 has a probability of 0.65 of turning up heads. A coin is tossed once, the decision maker must decide which coin was tossed. The probability that coin 1 was tossed is 0.6, and the probability that coin 2 was tossed is 0.4. The loss matrix is

	Coin 1 tossed	coin 2 tossed
A_1:say coin 1 tossed	0	2
A_2:say coin 2 tossed	2	0

(a) What is the Bayes' procedure(action) before the coin is tossed?

(b) What is the Bayes' procedure if the outcome is heads? What if it is tails? (20%)