

國立勤益科技大學九十九學年度研究所碩士班招生筆試試題卷
 所別：工業工程與管理系 組別：作業研究
 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。
 二、請附計算機

試題一：〈 35 分〉

Consider the following problem:

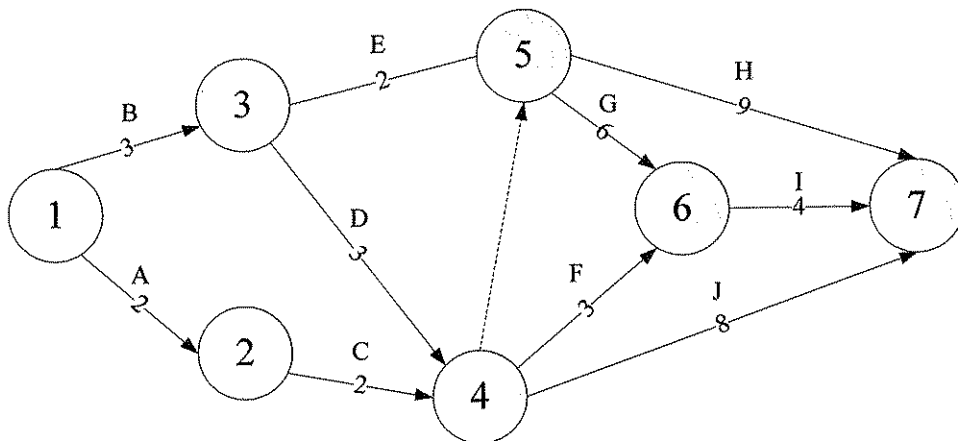
$$\begin{aligned} \min Z &= 6x_1 + 7x_2 + 3x_3 \\ \text{s.t. } 5x_1 + 6x_2 - 3x_3 &\geq 12 \\ x_2 - 5x_3 &\geq 10 \\ 2x_1 + 5x_2 + x_3 &\geq 8 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

- (1) Use dual simplex method to solve the problem.
- (2) Let y_1, y_2, y_3 be the dual variables. Determine the associated optimal dual solution.

試題二：〈 30 分〉

Consider the following Figure.

- (1) Find the slack times for each activity.
- (2) Which of the paths is a critical path?



試題三：〈 35 分〉

An operator attends to four automatic machines. After each machine completes a batch, the operator must reset it before a new batch is started. The processing time of a batch is exponential with 2 hours. The setup time is exponential with mean 20 minutes.

- (1) Compute the probability that all machines are in working.
- (2) Determine the expected number in the system.

試題四：〈 35 分〉

The matrix of transition probabilities is as follows.

$$\begin{array}{c} 1 \quad 2 \quad 3 \\ 1 \left[\begin{array}{ccc} .2 & .4 & .4 \\ .4 & .4 & .2 \\ .2 & .2 & .6 \end{array} \right] \\ 2 \\ 3 \end{array}$$

Please determine the stationary probabilities.

試題五：〈 30 分〉

Taiwan Bank is in the process of devising a loan policy that involves a maximum of \$12 million. The following table provides the pertinent data about available types of loans.

Type of loan	Interest rate	Bad debt ratio
Personal	0.140	0.10
Car	0.130	0.07
Home	0.120	0.03
Farm	0.125	0.05
Commercial	0.100	0.02

Bad debts are unrecoverable and produce no interest revenue.

Competition with other financial institutions requires the bank to allocate at least 40% of the funds to farm and commercial loans. To assist the housing industry in the region, home loans must equal at least 50% of the personal, car, and home loans. The bank also has a stated policy of not allowing the overall ratio of bad debts on all loans to exceed 4%.

Formulate the problem as an LP model. (It is unnecessary to find the optimal solution)

試題六：〈 35 分〉

ABC Company has three factories in Taoyuan, Changhua, Nantou, and three distribution centers in Taipei County, Taichung City, and Tainan City. The products are produced at three factories, and then shipped by truck to three distribution centers. The capacities of three factories during the next month are 110, 110, 80 truckloads. The monthly demands at the distribution centers are 120, 100, 90 truckloads. Suppose that the shortage of Tainan City distribution center is not allowed. The transportation cost per truckload between the factories and the warehouse is given in following table.

Factories	Distribution centers		
	Taipei County	Taichung City	Tainan City
Taoyuan	20	50	100
Changhua	70	20	50
Nantou	90	25	60

- (1) Find the optimal solution.
- (2) Which distribution center is short of satisfying its demand? How much is its short demand?