

大同大學 九十 學年度研究所碩士班入學考試試題

考試科目：管理科學

所別：資訊經營研究所

第 1/2 頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

1. Tatung University maintains a powerful mainframe computer for research use by its faculty. During all working hours, an operator must be available and maintain the computer, as well as to perform some programming services. John Lee, the director of the computer facility, oversees the operation. It is now the beginning of the spring semester, and John is confronted with the problem of assigning different working hours to his operators. Because all the operators are currently enrolled in the university, they are available to work only a limited number of hours each day, as shown in the following table.

| Operators | Wage rate (in \$/per hour) | Maximum hours availability | | | | |
|-----------|-------------------------------|----------------------------|---------|-----------|----------|--------|
| | | Monday | Tuesday | Wednesday | Thursday | Friday |
| B.W. | 10.10 | 6 | 0 | 6 | 0 | 8 |
| N.C. | 9.9 | 0 | 7 | 0 | 4 | 0 |
| W.Z. | 9.8 | 3 | 5 | 7 | 0 | 4 |
| C.L. | 10.90 | 3 | 0 | 3 | 8 | 0 |
| G.K. | 8.7 | 5 | 5 | 5 | 0 | 4 |
| D.H. | 11.0 | 0 | 0 | 0 | 5 | 3 |

There are six operators (four undergraduate students and two postgraduate students). They all have different wage rates because of differences in their experience with computers and in their programming skills. The above table shows their wage rates, along with the maximum number of hours that each can work each day. Each operator is guaranteed a certain minimum number of hours per week that will maintain an adequate knowledge of the operation. This level is set arbitrarily at 8 hours per week for the undergraduate students (B.W., N.C., W.Z. and D.H.) and 7 hours per week for postgraduate students (C.L. and G.K.). The computer facility is to be open for operation from 8 A.M. to 10 P.M. Monday through Friday with exactly one operator during these hours. On weekends, the computer facility is to be operated by other staff. Because of budget, John has to minimize costs. He needs to decide the number of hours he should assign to each operator on each day. Please formulate a linear programming model to solve the problem.

2. Solve the following linear problem using simplex method (20%)

$$\text{Minimise } z = -2x_1 + x_2 - 4x_3 + 3x_4$$

subject to

$$x_1 + x_2 + 3x_3 + 2x_4 \leq 4$$

$$x_1 - x_3 + x_4 \geq -1$$

$$2x_1 + x_2 \leq 2$$

$$x_1 + 2x_2 + x_3 + 2x_4 = 2$$

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

3. Find optimum for the following transportation problem.(20%)

| From | To | | | supply |
|--------|------|-----|------|--------|
| | 1 | 2 | 3 | |
| A | \$6 | \$9 | \$7 | 130 |
| B | \$12 | \$3 | \$5 | 70 |
| C | \$4 | \$8 | \$11 | 120 |
| Demand | 80 | 110 | 60 | |

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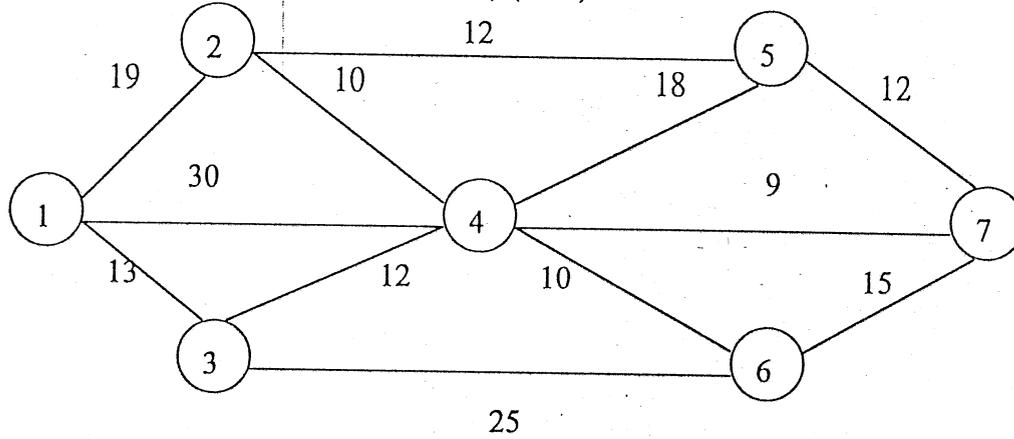
考試科目：管理科學

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第 2 頁

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4. Determine the shortest conveyor route from the distribution/inventory at node 3 to each of the other plants (nodes 2-10) (measure in meters) (20%)



5. Solve the following integer linear program with the initial solution $(x_1 = 2.22, x_2 = 5.56, z = 1056)$ (20%)

$$\begin{aligned} & \text{Max } z = 100x_1 + 150x_2 \\ & \text{subject to} \\ & \quad 8000x_1 + 4000x_2 \leq 40000 \\ & \quad 15x_1 + 30x_2 \leq 200 \\ & \quad x_1, x_2 \geq 0 \end{aligned}$$