

國立清華大學 101 學年度碩士班考試入學試題

系所班組別：工業工程與工程管理學系

考試科目（代碼）：生產管理 (1602)

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\*請在【答案卷】作答

1. (30%)

1.1 List three major performance measure of project management. (6%)

1.2 Explain the following terms in project management: WBS, SOW, Crashing (9%)

1.3 Tsing Hua Company is planning to use PERT/CPM to set up a project. They have established the following activities, precedence relationships, and time estimates in days (15%):

| Activity | Immediate Predecessor | Optimistic time | Most Likely time | Pessimistic time |
|----------|-----------------------|-----------------|------------------|------------------|
| a        | -                     | 8               | 10               | 12               |
| b        | -                     | 6               | 7                | 9                |
| c        | b                     | 3               | 3                | 3                |
| d        | a                     | 10              | 15               | 20               |
| e        | d                     | 6               | 7                | 8                |
| f        | c                     | 9               | 10               | 11               |
| g        | d                     | 5               | 7                | 10               |
| h        | e, f                  | 14              | 15               | 16               |

1.3.1. What is the expected duration for activity "b"? \_\_\_\_\_ (1%)

1.3.2. What is the variance of activity "d"? \_\_\_\_\_ (1%)

1.3.3. How many paths are there in the network? \_\_\_\_\_ (1%)

1.3.4. What is the earliest finish (EF) time for activity "e"? \_\_\_\_\_ (1%)

1.3.5. What is the slack for activity "f"? \_\_\_\_\_ (1%)

1.3.6. What is the critical path? \_\_\_\_\_ (2%)

1.3.7. What is the expected duration of the critical path? \_\_\_\_\_ (2%)

1.3.8. What is the standard deviation of the critical path? \_\_\_\_\_ (2%)

1.3.9. What is the probability of completing the project within 50 days? \_\_\_\_\_ (4%)  
 $p(Z < 1.10) = 0.864$ ,  $p(Z < 1.62) = 0.947$ ,  $p(Z < 2.12) = 0.983$ ,  $p(Z < 2.60) = 0.995$

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2. ( 8%)

Please use Hungarian method to develop an assignment plan minimizing the processing cost, given the information below. Please show the plan and the cost.

| Job | Machine |   |   |   |   |
|-----|---------|---|---|---|---|
|     | A       | B | C | D | E |
| 1   | 5       | 8 | 7 | 7 | 6 |
| 2   | 4       | 9 | 7 | 9 | 8 |
| 3   | 6       | 9 | 8 | 7 | 8 |
| 4   | 7       | 7 | 6 | 9 | 7 |

3. ( 12%)

The processing time and due date of five jobs are as following

| Job             | A | B  | C  | D  | E  |
|-----------------|---|----|----|----|----|
| Processing Time | 4 | 8  | 10 | 12 | 13 |
| Due Date        | 5 | 12 | 16 | 17 | 15 |

3.1. Which job will be selected first using Critical Ratio? (2%)

3.2. Which job will be selected first using Least Slack? (2%)

3.3. What is the average Work-In-Process level when Least Slack is used? (2%)

3.4. How many jobs will be late when Least Slack is used? (2%)

3.5. Please explain the difficulty in using Least Slack in practice. (4%)

4. (20%)

You are the government agent responsible to evaluate the productivity of three teaching hospitals. The number of patients treated, number of nurses used and number of intern doctors used are given in the following table. Intern doctors are considered as human resources for the hospitals. However, training intern doctors is also a very important mission of teaching hospitals. Clearly rank the productivity of these three hospitals and present your reasoning. Note, there may not be absolute answer; therefore your reasoning is very important.

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4.1 Given the following information, rank the productivity of these three teaching hospitals and present your reasoning. (10%)

| Hospital | Number of Patients Treated | Number of Nurses Used | Number of Intern Doctors Used |
|----------|----------------------------|-----------------------|-------------------------------|
| A        | 10                         | 8                     | 7                             |
| B        | 8                          | 10                    | 7                             |
| C        | 10                         | 6                     | 7                             |

4.2 Given the following information, rank the productivity of these three teaching hospitals and present your reasoning. (10%)

| Hospital | Number of Patients Treated | Number of Nurses Used | Number of Intern Doctors Used |
|----------|----------------------------|-----------------------|-------------------------------|
| A        | 10                         | 8                     | 7                             |
| B        | 8                          | 10                    | 7                             |
| C        | 10                         | 8                     | 9                             |

5. (15%)

Depending on how many tasks need to be completed after the customer places his order, we have three operations strategy: Make-to-order, Assemble-to-order, and Make-to-stock. Assume your default operations strategy is Assemble-to-order. Will you tend to choose Make-to-order or Make-to-stock strategy if one of the following situations occurs? Explain why.

5.1 Variation of production lead times increases. (5%)

5.2 Variation of demands decreases (5%)

5.3 Number of products increases (5%)

6. (15%)

According to the historical data, the number of no show customers of Tsing Hua Airline's Taipei-Tokyo route is uniformly distributed between 1 and 10. There are 100 seats in the airplane. The sell price for each seat is \$350. The fixed operating cost including the fuel cost for the airplane without any passenger and the labor cost for pilots and flight attendants are \$20,000. The marginal operating cost to serve one additional passenger including food, beverage, and the fuel cost to carry extra weight is \$50. If there are more than 100 passengers show up, the Tsing Hua Airline will compensate each passenger who cannot be served for \$200. How many passengers should Tsing Hua Airline overbook? (10%) and what is the value of overbook option? (5%)