

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Questions [35%]

Please answer the following questions briefly and justify your answer.

1. **[20%]** Inventory Control: Describe and explain (a) ABC inventory categorization analysis; (b) a comparison between continuous review policy and periodic review policy; (c) a comparison between quantitative order method and periodic order method; (d) the four quadrants (review policy vs. order method) to suggest the inventory policy to ABC analysis.
2. **[15%]** Production Planning: Describe and explain the following terminologies, (a) aggregate production plan (APP); (b) master production schedule (MPS); (c) material requirements planning (MRP).

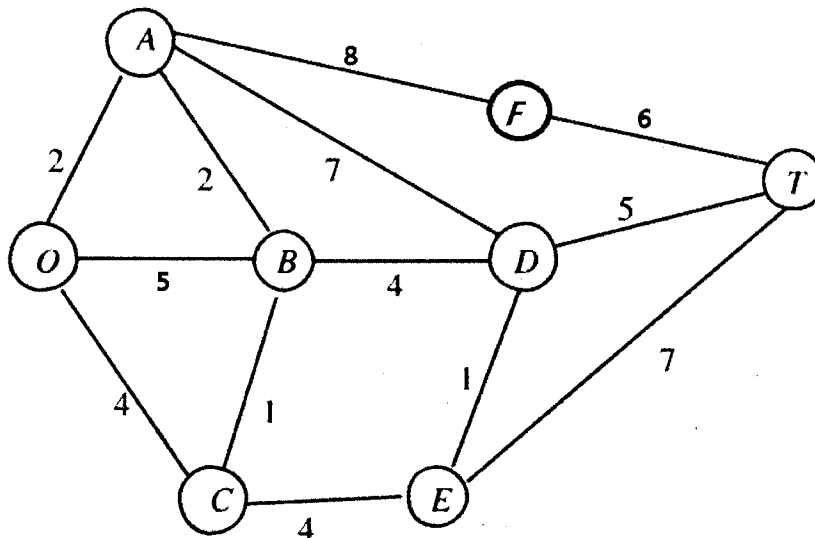
Numerical Problem and Analysis [65%]

Please answer the following numerical questions and show all your work in detail.

3. **[15%]** Facility Location Problem

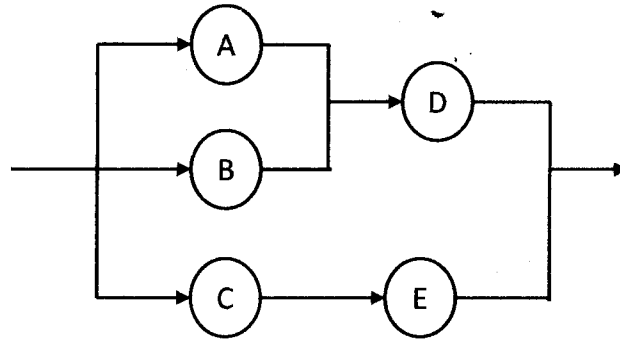
The NCKU City would like to build up a fire station to serve all the communities (i.e., O, A, B, C, D, E, F, and T) as following diagram. Please suggest the best location to ensure an emergent support with a minimum distance from fire station to each community. The value on the arc represents the distance.

- (a) **[5%]** What's the strategy or rule you suggest? (hint: max-max, max-min, min-max or others)
- (b) **[10%]** Apply the strategy you suggest and obtain an optimal location through the **detailed** numerical calculation.



4. [10%] Reliability Analysis

Calculate the system reliability if the reliability of each component is 0.9 in the following diagram.



5. [15%] Quality and Assurance Problem

NCKU company produces electrical wiring in 150-foot rolls. The quality inspection process involves selecting rolls of wire at random and counting the number of defects on each roll. The last 24 rolls examined revealed the following numbers of defects:

Roll	Number of Defects	Roll	Number of Defects
1	3	13	4
2	3	14	6
3	5	15	4
4	5	16	6
5	9	17	8
6	1	18	4
7	4	19	7
8	2	20	5
9	6	21	5
10	4	22	2
11	3	23	7
12	2	24	3

- (a) [5%] If the number of defects per 150-foot roll of wire follows a Poisson distribution, what is the estimate of the sample mean of the number of defects from these observations?
- (b) [5%] Using a normal approximation to the Poisson, what are the three-sigma control limits that you would use to monitor this process?
- (c) [5%] Are all 24 observations within the control limits?

6. [25%] Transportation Problem

The NCKU Company has agreed to supply its best customer with **3** business suits during **each** of the next 3 weeks (i.e., demand), even though producing them will require some overtime work. The relevant production data are as follows:

Week	Maximum Production, Regular Time	Maximum Production, Overtime	Production Cost per Unit, Regular Time	Production Cost per Unit, Overtime
1	2	2	\$3000	\$4000
2	1	2	\$5000	\$6000
3	3	2	\$4000	\$5000

The cost of storage is \$500 per unit for each week it is stored. There is already an inventory of **2** business suits on hand currently, but the company does not want to retain any business suits in inventory after the 3 weeks. Management wants to know how many units should be produced in each week to minimize the total cost of meeting the delivery schedule.

- (a) **[15%]** Formulate this problem as a transportation problem by constructing the appropriate parameter table.
- (b) **[10%]** Obtain an optimal solution by the northwest-corner method and the transportation simplex tableau algorithm.