

一、簡答題 (每題十分，共五十分)

1. As a contractor you have built a 100-unit apartment complex that rents for NT\$16,000 per unit a month. For the late completion you were assessed NT\$53,000 per day. Would you call the assessment liquidated damages or a penalty? Why?
2. Consider the design-bid process vs. the design-build process. How can the design-build process decrease the duration compared to a design-bid project? Why?
3. Why is the bid bond a "lead parachute" of performance and payment bonds?
4. Please explain the differences between "Top-Down Budgeting" and "Bottom-Up Budgeting"?
5. You are planning a construction project that will be performed from a remote camp. The estimators figure the job will require about 10,000,000 worker-hours to construct. The owner, a foreign government, has limited the construction of the base camp to a size that will accommodate 3,000 workers. It will take you about 6 months to phase up the worker force; the phase down can be done in three months. You decide to work 10 hours per day, 6 days per week, including holidays. What is an approximation of duration (months) of the project? The utilization profile of workers is shown in Figure 1.

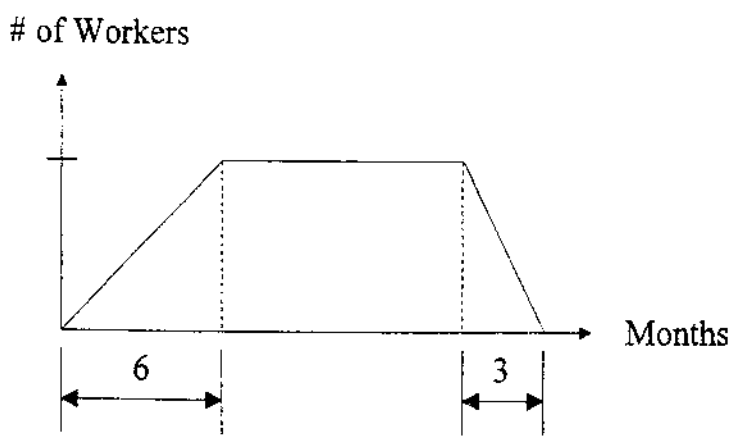


Figure 1

- 二、A real estate developer is considering building a 25-unit apartment complex in a growing town. Because of the long-term growth potential of the town, it is felt that the company could average 85% of full occupancy for the complex each year. If the items in Table 1 are reasonably accurate estimates, what is the **minimum monthly** rent that should be charged if a 12% per year MARR (Minimum Attractive Rate of Return) is desired? (Assuming that investment in land is recovered at the end of year 20 and that annual upkeep is directly proportional to the occupancy rate,) (十五分)

Hint $F = A \left[\frac{(1+i)^N - 1}{i} \right]$ $P = A \left[\frac{(1+i)^N - 1}{i(1+i)^N} \right]$ $F = P(1+i)^N$
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(背面仍有題目,請繼續作答)

Table 1

Land investment cost	\$50,000
Building investment cost	\$225,000
Study period, N	20 years
Upkeep expense per unit per month	\$35
Property taxes and insurance per year	10% of total initial investment

三、Please answer the following questions, assuming that the duration of each activity is good estimate. (二十分)

1. Develop the project network according to the information in Table 2 and determine the **minimum project duration and critical activities.**
2. If weather is the major risk factor, can you identify activities that might be impacted by bad weather? If the contract limits the project to be finished within 100 days, what you would do to ensure that the project can be completed within the time limit?

Table 2

Activity ID	Description	Duration (days)	Predecessors
A	Award contract, permits	30	None
B	Obtain performance bond	14	None
C	Produce pipes and valves	30	A
D	Mobilize equipment	5	A, B
E	Survey line locations	10	A
F	Dig trenches	20	D, E
G	Lay and join pipes	30	C, F
H	Pressure test	2	G
I	Backfill trenches	3	H
J	Clean up-site, demobilization	5	I

四、You are a contractor who tries to bid on a project with a total cost of NT\$100 million. The project should be finished within one year. The average overdraft that you have estimated according to your detailed breakdown of the project cash flow is NT\$10 million per month over the one year period. You prepare the capital of NT\$ 5million. In addition, you add in only 3% of the project total cost as the bid price. As a result, you are awarded the contract and the interest rate of the construction loan is 6% per year compounding monthly. What is the approximated rate of return? What issues do you need to concern to ensure that the contract is profitable? **You have to express your assumptions.** (十五分)