

系所組別：土木工程學系戊組

考試科目：工程經濟

考試日期：0223，節次：2

※ 考生請注意：本試題可使用計算機

## 1. 回答下面問題：(15%)

- 1.1. 若 A 方案的內部投資報酬率為 17%，利潤現值分析為 9,000 元；B 方案的內部投資報酬率為 15%，利潤現值分析為 10,000 元；哪一個方案較佳？兩種分析方法是否有產生不一致的結果？為什麼？
- 1.2. 一般而言，如果銀行定存利率一直下降，保險費會增加還是減少？為什麼？
- 1.3. 假設你向銀行借貸十萬元，四年期，年利率 10%，請問下列哪個還款計畫，就最大化現值而言，哪個方案最好？為什麼？(A)四年後本金及利息一起償還 (B)每年償還利息，四年後償還本金 (C)分四年，每年等金額償還本金與利息 (D)第一年償還利息，第二年起償還償還本金與利。

## 2. You bought an apartment, which was on a 20 year mortgage of NT\$5,000,000 from a local bank. The bank asked you to pay back the loan by monthly payments on 3.6 % nominal interest rate. You have made payments for 5 years.

- 2.1. What was the monthly payment that you were asked to make with the local bank? (5%)
- 2.2. What is the remaining principal? (10%)
- 2.3. A new bank offers you a deal of refinancing your apartment with 2.4% nominal interest rate compounding monthly for the remaining 15 years. However, depositing a NT\$200,000 on saving account with no interest in the new bank is required. Will you move your mortgage to the new bank? If you decide to move, how long, at least, you should stay with the new bank, assuming your MARR is 0.75% per month? (10%)

## 3. Your company has purchased equipment (for \$60,000) that will reduce materials and labor costs \$9,000 each year for N year. After N years, there will be no further need for the machine, and because the machine is specifically designed, it will have no MV at any time. The equipment is depreciated on the straight-line basis with tax life of 6 years. If the effective tax rate is 40%, what is the minimum number of years your firm must operate the equipment to earn 10% per year after taxes on this investment? (20%)

4. The capital investment for a new construction machine is \$900,000. The estimated annual expense, in year zero dollars, is \$100,000. This expense is estimated to increase at the rate of 6.3% per year. Assume that  $f=4.5%$ ,  $N=7$  years, MV at the end of year seven is 15% of the capital investment, and the MARR (in real terms) is 10.05% per year. What uniform annual revenue (before taxes), in actual dollars, would the machine need to generate to break even? (20%)

5. A construction firm currently owns a heavy-duty tractor that has a present value (MV) of \$90,000. Estimates of the tractor's operating and maintenance (O&M) expenses and MV at the end of each of the remaining six years of useful life are in Table 2. The firm is considering a new heavy-duty tractor to replace the one presently owned. The new tractor's purchase price is \$240,000 and its estimated O&M and MV for each of the next six years of the study period are in Table 3. If the MARR= 10% per year,
- 5.1. what is the economical life of the new tractor? (10%)
- 5.2. should the new tractor be purchased? If so, when? (10%)

(背面仍有題目,請繼續作答)

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Table 2

	End of Year k					
	1	2	3	4	5	6
O&M	\$20,000	\$25,000	\$38,000	\$45,000	\$47,000	\$50,000
MV	\$70,000	\$60,000	\$50,000	\$40,000	\$30,000	\$20,000

Table 3

	End of Year k					
	1	2	3	4	5	6
O&M	\$10,000	\$12,000	\$16,000	\$17,000	\$20,000	\$25,000
MV	\$180,000	\$150,000	\$120,000	\$100,000	\$90,000	\$75,000

To Find:	Given:	Factor by Which to Multiply "Given"	Factor Name	Factor Functional Symbol
<i>For single cash flows:</i>				
F	P	$(1+i)^N$	Single payment compound amount	(F/P, i%, N)
P	F	$\frac{1}{(1+i)^N}$	Single payment present worth	(P/F, i%, N)
<i>For uniform series(annuities):</i>				
F	A	$\frac{(1+i)^N - 1}{i}$	Uniform series compound amount	(F/A, i%, N)
P	A	$\frac{(1+i)^N - 1}{i(1+i)^N}$	Uniform series present worth	(P/A, i%, N)
A	F	$\frac{i}{(1+i)^N - 1}$	Sinking fund	(A/F, i%, N)
A	P	$\frac{i(1+i)^N}{(1+i)^N - 1}$	Capital recovery	(A/P, i%, N)

$$F = \frac{G}{i}(F/A, i\%, N) - \frac{NG}{i}$$

$$P = \frac{A_1}{1+f}(P/A, i_{CR}\%, N)$$

$$i_{CR} = (1+i)/(1+f) - 1$$