

1. Please **explain** the following terms: (20%)

Sunk Cost

Liability

Debt Capital

Opportunity Cost

Depreciation

2. The board of a residential community wishes to establish a fund at **the end of 2005** that by the end of year 2022 will grow to an amount large enough to place new elevators for its own 3 buildings. Each building has two elevators operated. A new elevator is estimated to cost NT\$2M in 2020. In 2020, two new elevators will be installed in one of the three buildings. Another building will have new elevators in 2021 at the cost of NT\$2.1M each elevator. The last building will be re-elevated in 2022 at cost of NT\$2.2M each elevator. The annual effective interest rate that can be earned on this fund is 3%. How much money each year should be saved starting at **the end of 2006** to pay all new elevators? (20%)

3. A construction contractor is preparing a fixed-price bid for the construction of an industrial plant, which is expected to take **two years** to construct. Detailed estimates indicate the cost listed below will be incurred for the project.

**Labor, equipment, materials, etc. = \$40,000,000**

**Supervision, overhead, etc. = \$8,000,000**

These costs are expected to occur at a **constant monthly rate** over 24 months of construction. In addition the contractor adds a profit and contingency factor of 4% as a reasonable return on investment and to help offset some of the risks involved in this **long-term 24-month contract**. The owner will pay the contractor in one lump sum upon completion of the project **at the end of month 24**. Consequently the contractor needs to finance the construction of the project by borrowing 24 **uniform payments at the beginning of each month**. The bank agrees to open a line of credit with the contractor that permits borrowing whatever funds are needed at a nominal interest rate of 3% per year (compounded monthly) on the outstanding balance. The outstanding balance will be paid back at the end of month 24.

3.1. What is the total bid price that the contractor will propose to the bid inviter? (10%)

3.2. If 1% inflation is considered (1%/12 per month) what the total bid price is? (10%)

4. Suppose that a new equipment has a cost basis of \$12,000 and a salvage value of \$3,000 at the end of **6 years**. This asset is depreciated by the Straight-Line method. The effective income tax rate is 40 % and the after-tax MARR  $i_c = 10\%$ . If the company is going to sell this asset **after 3 years at the market value of \$6000** what is the minimum profit per year this equipment should produce to breakeven the investment? (20%)

(背面仍有題目,請繼續作答)

編號：F184 系所：土木工程學系戊組

科目：工程經濟

5. **Ten years ago**, a corporation built a facility at a cost of \$400,000 in an area that has since developed into a major retail location. At the time the facility was constructed, it was estimated to have a **depreciable life of 20 years with no market value** and straight-line depreciation has been used. The corporation now finds it would be more convenient to be in a less congested area and can sell the old facility for \$250,000. A new facility in the desired location would cost \$500,000 and have a **depreciable life of 10 years**. The annual savings of \$4,000 per year is expected with the new facility. Insurance on the old facility has been \$20,000 per year while for the new facility it is estimated to be \$15,000. **The study period is 10 years** and the estimated market value of the new facility at the end of 10 years is \$200,000. The corporation has a 40% income tax rate and capital is worth 12% per year after taxes. Should the corporation (1) keep the old facility or (2) sell the old facility and build the new facility? (20%)

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	$(A/P, i\%, N)$

$$F = \frac{G}{i}(F/A, i\%, N) - \frac{NG}{i}, \quad P = \frac{A_1}{1+f}(P/A, i_{CR}\%, N), \quad i_{CR} = (1+i)/(1+f) - 1$$