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

1. 回答下面問題：(20%)

　1.1. 說明若 A 方案的 Internal rate of Return (IRR)為 15%, B 方案的 IRR 為 16%，就金錢價值而言 B 方案是否一定比 A 方案為優？

　1.2. 使用 Minimum Attractive Rate of Return (MARR) 或 Weighted Average Cost of Capital (WACC)進行方案分析，有何不同？

　1.3. 為何進行工程經濟分析時，收入支出均須考慮其時間價值？

　1.4. 折舊常應用在工程經濟分析上，當作減稅上的效益，但不是所有資產都可折舊，列出三個資產可折舊的條件。

2. A company has issued 10-year bonds, with a face value of $1,000,000, in 100 units. Interest at 8% (per year) is paid quarterly. (20%)

　2.1. If an investor desires to earn 12% nominal interest (compounded quarterly) on $10,000 worth of these bonds, what would the purchase price have to be?

　2.2. If the company plans to redeem these bonds in total at the end of 10 years and establishes a fund that earns 8%, compounded semiannually, for this purpose, what is the annual cost of interest and redemption?

3. A real estate developer has borrowed $30 Million to build a community of 300 apartments at a newly developed residential district. The money was borrowed at 6% annual interest, and the loan is to be paid in equal annual amount over a 40-year period. However, since the apartments will be ready for occupancy after 3 years of construction. The loan is deferred to pay back after the apartments are ready for occupancy. The Annual operating, maintenance, and insurance expenses are estimated to be $4,000 per apartment, and these expenses will increase according to the inflation rate but are independent of the occupancy rate for the apartments. The rental fee for each apartment is set to be 14,000 per year at the first year and will increase according to the inflation rate. Land was acquired several years ago and is excluded in the analysis. (20%)

　3.1. What is the average breakeven occupancy rate for the apartments?

　3.2. If the occupancy rate for the apartment is estimated to be 80%, what is the rental fee for each apartment to breakeven?

　3.3. If the inflation rate is estimate to be 2% per year after the first year, what is the average breakeven occupancy rate for the apartments?

4. An engineering design firm is considering a bank loan for purchasing a new machine costing $150,000. The loan is agreed at the annual rate of 7.2% for 5 years compounded monthly (20%)

　4.1. What is the monthly repayment amount of principal and interest?

　4.2. What is the total interest paid over the first 3 years?

　4.3. After 36 payments, what is the outstanding that the firm needs to pay off the loan?

5. A contractor has purchased a heavy machine for $1,500,000 that will reduce materials and labor costs by $420,000 each year for N years. After N years, there will be no further need for the machine, and because the machine is specially designed, it will have no MV at any time. However, you can depreciate the equipment on an SL (Straight Line) basis with a tax life of five years. If the effective income-tax rate is 40%, what is the minimum number of years the contractor must operate the equipment to earn 10% per year after taxes on its investment? (20%)

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

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

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