snapper is not always available and that substitution of a cheaper fish at the price of the snapper is never made by the restaurant. Since red snapper is one of the "big sellers," the owner could place a separate note in the menu when snapper is not available and mention that ocean perch is available, has the same taste and texture, and sells at a significantly lower price than snapper.

The biggest lesson for the owner is to realize that the "rationization" of doing customers a service by deceptive acts is totally wrong and unethical. The owner’s future practices need to be based on honesty in advertising and pricing for all of his menu items.

**SUMMARY**

Engineering economy is the application of economic factors to evaluate alternatives by considering the time value of money. The engineering economy study involves computing a specific economic measure of worth for estimated cash flows over a specific period of time.

The concept of equivalence helps in understanding how different sums of money at different times are equal in economic terms. The differences between simple interest (based on principal only) and compound interest (based on principal and interest upon interest) have been described in formulas, tables, and graphs.

The MARR is a reasonable rate of return established as a hurdle rate to determine if an alternative is economically viable. The MARR is always higher than the return from a safe investment and the corporation’s cost of capital.

Also, this chapter introduced the estimation, conventions, and diagramming of cash flows.

**PROBLEMS**

**Definitions and Basic Concepts**

1.12 Of the fundamental dimensions weight, mass, time, and electric charge, which one is the most important in economic analysis? Why?

**Interest Rate and Equivalence**

1.13 The term that describes compensation for "sacrificing" money is what?

1.14 When an interest rate statement does not include a time period, e.g., 3%, the time period is assumed to be what?

1.15 The original amount of money in a loan transaction is known as what?

1.16 What is meant by the term minimum attractive rate of return (MARR)?

1.17 When the yield on a U.S. Government Bond is 3% per year, investors expect the inflation rate to be approximately what?

1.18 In order to build a new warehouse facility, the regional distributor for Valsir Multi-position Valves borrowed $1.6 million at 10% per year interest. If the company repaid the loan in a lump sum amount after two years, what was (a) the amount of the payment, and (b) the amount of interest?

1.19 A medium-size consulting engineering firm is trying to decide whether it should remodel its office now or wait and do it one year from now. If the firm does it now, the cost will be $50,000. The interest rate is 10% per year.

(a) What would the cost be to have it done one year from now to render the decision meaningless?

(b) If the cost one year from now is $41,600, should the firm remodel now or later?

1.20 At an interest rate of 8% per year, $50,000 one year hence is equivalent to how much now?

1.21 Bennett Industries invested $10,000,000 in a co-venture one year ago. One year later, Bennett realized a profit of $1,450,000. What annual rate of return does this represent?

1.22 Truwing giant Yellow Corp agreed to purchase rival Roadway for $966 million in order to reduce so-called back-office costs, that is, payroll and insurance, by $45 million per year. If the savings are realized as planned, what is the rate of return on the investment?

1.23 If Fleet Motor Company’s profits increased from 22 cents per share to 25 cents per share in the April-June quarter compared to the previous quarter, what was the rate of increase in profits for that quarter?

1.24 A broadband service company borrowed $2 million for new equipment and repaid the principal of the loan plus $275,000 interest after 1 year. What was the interest rate on the loan?

1.25 A design-build engineering firm completed a pipeline project wherein the company realized a profit of $2.3 million in one year. If the amount of money the company invested was $6 million, what was the rate of return on the investment?

1.26 A sum of $2 million now is equivalent to $2.36 million one year from now at what interest rate?

1.27 Last year, Lee Industries decided to restructure some of its debt by paying off one of its short-term loans. To do so, the company borrowed the money one year ago at an interest rate of 10% per year.

1.28 A start-up company with multiple nanotechnology products established a goal of making a rate of return of at least 25% per year on its investments within the first five years. If the company acquired $400 million in venture capital, how much did it have to earn in the first year?

1.29 How many years does it take for an investment of $280,000 to accumulate to at least $757,000 at 15% per year interest?

1.30 The MARR used for a project’s acceptance or rejection is set relative to what cost?

1.31 An engineer told you that a project is economically acceptable when it’s rate of return equals or exceeds the corporation’s cost of capital. Is this correct? Explain your answer.

**Simple and Compound Interest**

1.32 Valley Rendering, Inc. is considering the purchase of a new flotation system for recovering more grease. The company can finance a $150,000 system at 5% per year compound interest or 5% per year simple interest.

(a) If the total amount owed is due in a single payment at the end of 3 years, which interest rate should the company select?

(b) How much is the difference in interest between the two schemes?

1.33 Valsir Electronic Systems, Inc. invest in a lump sum investment four years ago in order to finance a plant expansion now. The money returned 10% per year simple interest. How much did the company set aside if the investment is now worth $950,000?

1.34 At 10% per year simple interest, how long will it take for a deposit of $1000 now to accumulate to $100,000?

1.35 Fill in the missing values A through D in the table for a loan of $10,000, if the interest rate is compounded at 10% per year.

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<th>End-of-Year Payment</th>
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