

## 270 ♦ Practical Concepts for Capstone Design Engineering

19. Fifteen years ago, \$5,000 was deposited in a bank account. Today, there is \$12,700 in the account. The bank pays interest monthly. What is the nominal interest rate paid on this account over the 15 years?
20. For a stated interest rate of 6% per year, find the effective interest rate for quarterly, monthly, weekly, daily, and continuous compounding. Graph the result.
21. A 40-year-old engineer wants to set up a retirement fund to be used starting at age 65. She invests \$20,000 now at 6% interest compounded annually. How much will be in the account at retirement? If she contributes another \$5,000 a year for the next 10 years, what will the value be? Would she be better off putting \$5,000 into the account from age 25 to 35 versus starting now? Show the comparison costs.
22. If you invest \$2,000 today in a savings account at an interest rate of 12% compounded annually, what will the value of the investment be in 7 years? If inflation is 4% per year over the same period, what is the actual purchasing value of your money?
23. The annual income from a toll highway is \$200,000. If invested at an effective annual interest rate of 6% per year, how much money would be in the account at the end of 10 years:
  - a. \$2.2 million
  - b. \$2.6 million
  - c. \$2.7 million
  - d. \$2.11 million
24. A warehouse was purchased for \$500,000 10 years ago. The effective annual interest rate in the ensuing 10 years was 8% per year. Assuming no depreciation or deterioration, how much is the building worth today:
  - a. \$427,000
  - b. \$540,000
  - c. \$678,000
  - d. \$1,079,450
25. For the warehouse in the previous problem, if inflation was 2.5% per year during the same period, what is the actual value of the building in 2000 dollars (assuming it is 2010):
  - a. \$427,000
  - b. \$540,000
  - c. \$875,000
  - d. \$691,000
26. A warehouse is sold for \$1 million. The purchase price 10 years ago was \$500,000. What is the rate of return on this investment?
27. A robotics system will be purchased for a factory. The lease-purchase cost is \$100,000 per year. Warranties also will be purchased. The warranties start at \$20,000 in year 5 and increase by \$20,000 per year through the end of the 10-year lease. What is the present worth of the lease-purchase project at an interest rate of 4% compounded annually?
28. A stream of payments over a 5-year period with an interest rate of 5% per year compounded annually has a present worth of \$100,000. Payments in years 1, 4, and 5 are \$15,000, \$30,000, and \$35,000, respectively. The value in years 2 and 3 must be determined. Year 3 is twice year 2. What is the value of year 2 and year 3 payments?
29. A backhoe is purchased for \$60,000. It is owned for 5 years and then sold for \$10,000. What is the depreciation each year? What is the book value and the amount of accumulated depreciation in year 3?