

Name: _____

Recitation Section: L _____

Student Number: _____

1. Verify that you have all 7 pages (cover, 5 problems, formula sheet) of the exam. This exam was distributed in multiple sections; when you finish, be sure to turn in all pages for grading.
2. Read all instructions and problems carefully. Points will be deducted for failure to follow instructions.
3. PRINT your name and student number in the spaces at the top of ALL pages of this exam. Enter your recitation section in the indicated space above on this cover page.
4. **Show ALL of your work on these pages.** The pages in this exam may be separated for grading; therefore, if you need extra space for a particular problem, write on the back of the page for that problem. The instructions for a specific question may limit the amount of space allowed for an answer. For all multiple-choice questions, select the closest, or most appropriate, answer. Answers without supporting calculations may be discounted.
5. You are permitted one sheet (8 1/2 x 11, double-sided) of **handwritten** notes; photocopies, reductions, etc. are prohibited. Use of any other notes, books, or other resources is prohibited.
6. Calculators are permitted solely for the purpose of performing numerical computations. You are not allowed to use the calculator memory to store notes, etc.
7. This exam lasts for 70 minutes. Point values are listed for each problem to assist you in best using your time.

_____	Problem 1.	(25 points possible)
_____	Problem 2.	(20 points possible)
_____	Problem 3.	(15 points possible)
_____	Problem 4.	(25 points possible)
_____	Problem 5	(15 points possible)
_____	TOTAL.	(100 points possible)

Problem 1. (25 points)

(3 points each) Answer the following multiple-choice questions by circling the letter in the right-hand column that corresponds to the most appropriate response.

- A. If interest is compounded multiple times during each period, the effective interest rate will be _____ the nominal interest rate. **a b c d**
 (a) less than (c) greater than
 (b) equal to (d) unrelated to
- B. Which of the following is the best example of **partitioning** in the design process? **a b c d**
 (a) dividing the functions of a system between hardware and software elements
 (b) dividing a schematic diagram into sections for multiple printed circuit boards
 (b) using multiple copies of the same sub-circuit in several different parts of a design
 (d) combining several pieces of a design into a single unit
- C. Which of the following is the best example of **modularity** in the design process? **a b c d**
 (a) dividing the functions of a system between hardware and software elements
 (b) dividing a schematic diagram into sections for multiple printed circuit boards
 (c) using multiple copies of the same sub-circuit in several different parts of a design
 (d) combining several pieces of a design into a single unit
- D. Which of the following factors most strongly contributed to the collapse of the Hyatt Regency walkway? **a b c d**
 (a) rare combination of unexpected events (c) management communication failure
 (b) clearly defined ethical lapse (d) improper implementation of design
- E. Which of the following generally is **not** one of the benefits of dividing a large design project into multiple, parallel activities? **a b c d**
 (a) fewer workers needed (c) reduce elapsed time to completion
 (b) utilize discipline-specific knowledge (d) localize effects of design changes

(2 points each) For each of the following statements, circle the most appropriate response in the right-hand column.

- F. The terms “hierarchical decomposition” and “bottom-up” generally mean the same thing in describing a design process. **TRUE FALSE**
- G. Given a geometric gradient series of payments over n years at interest rate i , there is an equivalent uniform series of payments also over n years at interest rate i . **TRUE FALSE**
- H. A rare combination of events that were individually anticipated may lead to an unexpected disaster, even in a good design. **TRUE FALSE**
- I. The principal advantage of simulation compared to building a prototype is reduced cost. **TRUE FALSE**
- J. One of the primary purposes of QFD diagrams is to identify and clarify relationships between different levels of abstraction or different stages in the design process. **TRUE FALSE**

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Problem 3. (15 points)

Your company is preparing to buy a major computer and telecommunications system with the following economic characteristics:

Purchase Price:	\$250,000
Expected Lifetime:	10 years
Salvage Value:	\$25,000
Electricity cost	\$6,000 first year; increases 3% per year
Annual Interest Rate:	7%

- A. (10 points) The manufacturer offers two maintenance options. **Option 1:** Pay for routine maintenance charges as needed, estimated to cost \$5,000 per year, plus major system upgrades costing \$20,000 at the end of the 4th and 8th years. **Option 2:** Buy a five-year maintenance/upgrade contract for \$30,000 at the time of initial purchase, with annual renewal charges of \$9,000 at the end of years 5 through 9.

Determine the **present value** of the lifetime maintenance costs for each of these options:

Option 1: _____ Option 2: _____

- B. (5 points) Determine the **annualized** cost of this system, including all of the above factors and selecting the less expensive maintenance option.

Annualized cost: _____

You **MUST** show your work (formulas and numerical values) to justify your answers. If you need more space, use the back of *this page*. Correct answers without supporting work will not receive full credit.

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Problem 4. (25 points)

For each of the following economic computations, (a) list the conversion factor to be used, specifying the parameter values, and (b) compute the result, showing your work. Write your answers on the blank lines on the right edge of this page; correct answers in other locations may not receive full credit. An example is provided.

EXAMPLE:

If you invest \$100 in a bank account today, at an interest rate of 6.5%,
how much will you have after five years? (a) (F/P, 6.5%, 5)

$100 (F/P, 6.5\%, 5) = 100 (1 + 0.065)^5 = 100 * 1.3701 = 137.01$ (b) \$ 137.01

A. (5 points) New manufacturing equipment will cost \$400,000, with
an expected salvage value of \$50,000 after 30 years of use. (a) _____
Assuming an interest rate of 6.5%, what is the net present cost? (b) _____

B. (5 points) You decide to buy a \$250,000 house. Assuming a
20% down payment and a 6% annual interest rate, (a) _____
what will be the monthly payment on a 30-year mortgage? (b) _____

C. (5 points) You deposit \$1000 into a savings account at the end of
each year. Assuming the account earns 8.5% annually, how (a) _____
many years are required for account to reach (or exceed) \$15, 000? (b) _____

D. (10 points) Your company purchases a machine with a present cost
of \$50,000. The payment plan consists of four annual payments of (a) _____
\$10,000 and a final payment at the end of the fifth year. Assuming
an interest rate of 7%, what will be the amount of the final payment? _____

NOTE: This problem may require the use of more than one
conversion factor. List all factors used. (b) _____

