

Name: _____

Recitation Section: L _____

Student Number: _____

Graduating Spring 2002? _____ YES _____ NO

1. Check that your exam includes all 6 pages (cover, 6 problems). Additionally, there is a 2-sided formula sheet.
2. Read all instructions and problems carefully. Points will be deducted for failure to follow instructions.
3. Complete the information requested in the spaces above.
4. PRINT your name and student number in the spaces at the top of all remaining pages of this exam.
5. **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.
6. You are permitted one sheet (8 1/2 x 11, double-sided) of **handwritten** notes. Use of any other notes, books, or other resources is prohibited.
7. Calculators are permitted; however, you are not allowed to use the calculator memory to store notes, etc.
8. This exam lasts for 50 minutes. Point values are listed for each problem to assist you in best using your time.

_____	Problem 1.	(20 points possible)
_____	Problem 2.	(20 points possible)
_____	Problem 3.	(18 points possible)
_____	Problem 4.	(22 points possible)
_____	Problem 5	(8 points possible)
_____	Problem 6	(12 points possible)
_____	TOTAL.	(100 points possible)

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Problem 1. (20 points)

For each of the following economic computations, (a) list the conversion factor(s) 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)

(b) \$ 137.01

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

A. (5 points) A company purchases a piece of equipment by paying \$5,000
per year for 10 years. Assuming that a compound rate of interest of 6%
is appropriate, determine the equivalent present cost of the equipment,
assuming that, after the 10 years of payments, the equipment will be
worthless. There are no other associated costs. (a) _____
(b) _____

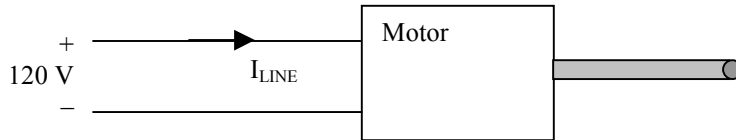
B. (5 points) An individual deposits \$8,000 semiannually (every six
months) into a savings account. How much does the individual have at
the end of 8 years, assuming that she is able to invest her funds at a
nominal rate of 10% per year? (a) _____
(b) _____

C. (10 points) A new piece of machinery with a 6-year useful lifetime is
expected to have maintenance costs of \$12,000 per year for the first
four years of use and then have maintenance costs of \$6,000 per year
for the last two years. Determine the present value of the maintenance
costs, assuming an interest rate of 8%. (a) _____

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

Problem 2. (20 points)

For this problem an interest rate of 6% is appropriate. The power supply line has an effective value of line voltage of 120 volts, an effective value of line current of 200 amperes, and a power factor of .75 lagging. The purchase cost of the motor is \$12,000.



- A. (7 points) Determine the cost of power for one year for the motor, assuming that it operates 300 days per year, 16 hours per day, and at a cost of power of \$.06 per KW-hr.

Cost = _____

- B. (7 points) Assume that the first year cost of maintenance for the motor is \$400 and that the maintenance cost increases by 4% per year. Determine the present value of the cost of maintenance for the motor, assuming an 8 year operation.

Cost = _____

- C. (6 points) In recitation #3, the engineering economy problem posed had a lowest cost solution that required the use of 3 synchronous motors and 1 induction motor. Why might this solution not be the best one in a practical industrial situation, or should one always pick the lowest cost (as calculationally determined) solution? Give 2 specific reasons.

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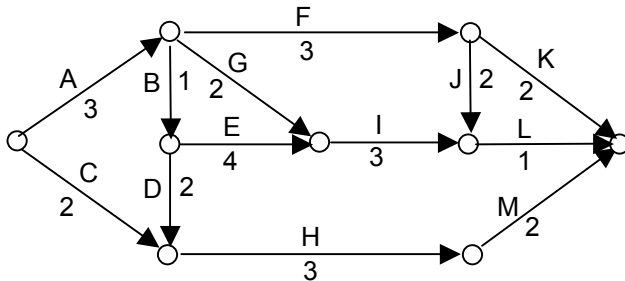
Problem 3. (18 points)

Answer the following multiple-choice questions by circling the letter in front of the most appropriate response.

- A. The primary advantage of Gantt Charts over CPM diagrams for project scheduling is that
- (a) Gantt charts clearly show the chronological (time) relations among the various activities.
 - (b) Gantt charts show the logical precedence relations more clearly than do CPM charts.
 - (c) Gantt charts allow for a variation in time for each activity, and allow for a probabilistic estimate of a given delay.
 - (d) Gantt charts more clearly illustrate the design process.
 - (e) Gantt charts allow for indication of reporting requirements.
- B. A utility company sometimes adjusts the cost of power if a purchaser adjusts the load power factor because
- (a) The load power factor needs to match that of the line.
 - (b) Line losses can be reduced.
 - (c) It is desirable to have a large line current.
 - (d) A highly efficient motor is expensive to operate.
- C. The technical purpose of the development of a family of microprocessors by the multi-company alliance discussed in Recitation #2 was
- (a) the development of increasingly cheaper machines over time;
 - (b) the development of a prototype for an ultra-high performance supercomputer;
 - (c) the development of progressively high performance machines;
 - (d) the development of a totally recyclable desk-top computer.

Problem 4. (22 points)

- A. (6 points) Determine the critical path for the following CPM chart. State the path in terms of activity letters in order from start to finish. Example: CHM



Critical Path _____

- B. (6 points) Determine the float for

(i) Activity B

Float B = _____

(ii) Activity D

Float D = _____

- C. (4 points) Assume now that the above chart is also a PERT chart and that activity H is characterized by

Shortest time = 2.2

Most likely time = 3.0

Longest time = 5.8

Determine the expected time for activity H

Expected time = _____

- D. (6 points) Assume that, for a slightly different PERT chart, the project duration is 18 months and the variance is 4 months². Determine the probability that the project will require greater than 21 months to complete.

Probability = _____

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Problem 5. (8 points)

For each of the sentence pairs below, select the sentence (#1 or #2) that is **incorrect**, by either word usage, spelling, or content (do not consider punctuation).

- A. #1 The affect of the storm in Oregon was dramatic.
#2 The university was unable to effect a solution to the budgetary difficulty.
- B. #1 The design team was unable to find an adequate amplifier among the three tested.
#2 Among the two giraffes stood a single hyena.

Problem 6. (12 points)

For each of the following statements, circle either TRUE or FALSE.

- A. To construct a prototype, the design must be modular in nature. **TRUE FALSE**
- B. The success of hierarchical decomposition in increasing modularity and specialization is heavily dependent on the definition of the interfaces between and the interactions among sub-elements. **TRUE FALSE**
- C. In the design process, one of the major advantages of partitioning is the ability to work on multiple tasks in parallel, leading to shorter calendar time to completion. **TRUE FALSE**
- D. In group decision-making, the number of possible communication interactions is linearly proportional to the number of group members. **TRUE FALSE**