

Name: _____

Recitation Section: L _____

Student Number: _____

Graduating Summer 2003? _____ YES _____ NO

1. Check that your exam includes all 7 pages (cover, 7 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. For all multiple choice questions, select the closest, or most appropriate, 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 65 minutes. Point values are listed for each problem to assist you in best using your time.

_____	Problem 1.	(20 points possible)
_____	Problem 2.	(18 points possible)
_____	Problem 3.	(12 points possible)
_____	Problem 4.	(22 points possible)
_____	Problem 5	(9 points possible)
_____	Problem 6	(9 points possible)
_____	Problem 7	(10 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)

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

(b) \$ 137.01

A. (5 points) An individual has a choice of receiving an annual retirement payment of \$15,000 per year for 20 years, or an immediate equivalent lump-sum payment. Determine the equivalent lump-sum, assuming that a compound rate of interest of 6% is appropriate. (a) _____
(b) _____

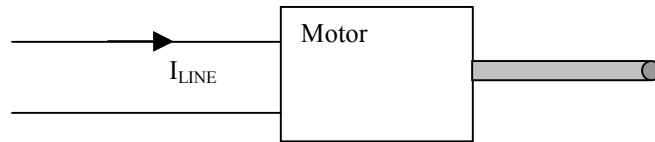
B. (5 points) An individual deposits \$280,000 into a retirement savings account. How much can the individual withdraw quarterly (every 3 months) for 8 years, assuming that she is able to invest her funds at a nominal rate of 8% per year? (a) _____
(b) _____

C. (10 points) A new piece of machinery with an 8-year useful lifetime has a purchase price of \$36,000. It is to be paid for by a series of 8 annual payments, such that each of the first four payments is twice the amount of each of the last four payments. Determine the amount of the first payment, 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. (18 points)

For this problem an interest rate of 8% is appropriate. The motor operates at a rated line voltage of 120 volts, and has an output power of 40 KW, a power factor of .7 lagging and an efficiency of 80%. The purchase cost of the motor is \$20,000.



- A. (6 points) Determine the cost of power for one year for the motor, assuming that it operates 360 days per year, 12 hours per day, and at a cost of power of \$.06 per KW-hr.

Cost = _____

- B. (6 points) Assume that the first year cost of maintenance for the motor is \$800 and that the maintenance cost increases by 5% per year. Determine the present value of the cost of maintenance for the motor, assuming an 8 year operation.

Cost = _____

- C. (6 points) Determine the present value of the lifecycle cost of the motor, including purchase cost, maintenance cost, power cost, and assuming a salvage at the end of its life of \$4,000.

Lifecycle Cost = _____

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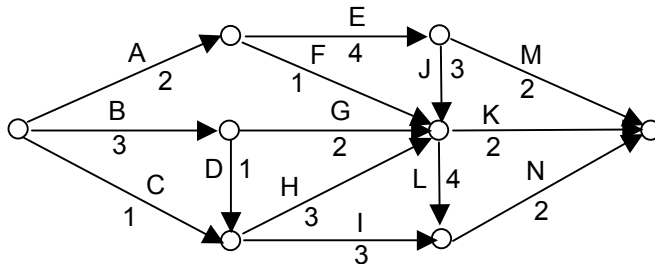
Problem 3. (12 points)

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

- A. The project completion time for a PERT Chart is assumed to be a normally distributed random variable. This assumption is most closely related to the concept that
- (a) each activity is assumed to have both a shortest and a longest time for completion.
 - (b) the individual activity times are uncorrelated random variables, and the central limit theorem applies to the sum.
 - (c) the float is zero along a critical path.
 - (d) the earliest and latest starts are uncorrelated random variables.
 - (e) the critical path is the longest path from start to finish.
- B. Which one of the following statements is most nearly correct?
- (a) A fundamental disadvantage associated with reuse is that the technology can change, rendering the process uneconomical.
 - (b) A fundamental disadvantage associated with reuse is that the mixed material components are difficult to separate.
 - (c) A fundamental advantage associated with reuse is that the material constituents are not a significant portion of the cost.
 - (d) A fundamental disadvantage associated with recycling is that it is frequently becomes uneconomical due to technological change

Problem 4. (22 points)

A. (6 points) Determine the critical path and project duration for the following CPM chart. State the path in terms of activity letters in order from start to finish. Example: AE M



Path _____

Project Duration _____

B. (6 points) Determine the float for

(i) Activity E

Float E = _____

(ii) Activity G

Float G = _____

C. (5 points) Assume that, for a slightly different diagram, a PERT chart, the project duration is 18 months and the standard deviation is 9 months. Determine the probability that the project will require greater than 15 months to complete.

Probability = _____

D. (5 points) The PERT chart described in Part C has a set of logical precedence relations described by the following:

Activity A and B must be done before activity D

Activities B must be done before activity E

Activities B and C must be done before activity F

Sketch the portion of the chart that describes the above conditions. Represent all dummy activities with a dashed line (-----) and arrowhead >.

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Problem 5. (9 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 university was unable to settle the dispute between the three students.
#2 The university was unable to effect a solution to the budgetary difficulty.
- B. #1 There were less students registered for the afternoon laboratory section.
#2 Fewer than six hours had passed before it was time to depart.
- C. #1 A biannual payment can mean a payment due approximately every two years.
#2 A semiannual payment can mean a payment due approximately every two years.

Problem 6. (9 points)

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

- A. For the accelerated cost recovery method of depreciation, if the salvage value doubles, the first year depreciation expense charged decreases. **TRUE** **FALSE**
- B. In the design process, one of the major advantages of partitioning is the ability to utilize fewer people, even at the expense of a longer calendar time to completion. **TRUE** **FALSE**
- C. In group decision-making, the number of possible communication interactions is linearly proportional to the number of group members. **TRUE** **FALSE**

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Problem 7. (10 points)

A particular type of ceramic fastener used in final computer assembly must have a thermal characteristic specification of T greater than 1000. Two batches of 10,000 fasteners each are produced, with a mean and standard deviation of

Batch A: mean= 1,400

Standard deviation =200

Batch B: mean=1,900

Standard deviation=600

Which batch has the least number of expected defects, and what is that expected number? Justify your answer.

Batch _____

Number= _____