

Name: _____

Recitation Section: L _____

Student Number: _____

1. Check that your exam includes all 7 pages (cover, 6 problems). Additionally, there is a 2-sided formula sheet, and interest rate tables for 6% and 8%.
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. Answers without supporting calculations may be discounted.
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 55 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.	(16 points possible)
_____	Problem 4.	(14 points possible)
_____	Problem 5.	(12 points possible)
_____	Problem 6.	(20 points possible)
_____	TOTAL.	(100 points possible)

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Problem 1. (20 points)

A company is considering two different types of 100 horsepower motors to operate a large assembly line. The motors are scheduled to be in service for 10 years, and both will deliver the same operational characteristics for the assembly line. At the end of the tenth year, the equipment will be returned to the manufacturer, with a predetermined salvage value. An interest rate of 8% is to be used. Determine the equivalent annualized lifetime operating cost of each motor, including maintenance, electricity and salvage value, and then determine the cheapest motor. The purchase prices of both motors are equal, so that does not need to be considered. Show all calculations and factors. Factor calculations may be shown in space to right.

Motor #1

Maintenance \$4,000 per year.

Electricity: \$3,000 per year for years 1-5, \$6,000 per year for years 6-10

Salvage value of \$600 at end of tenth year

Motor #2

Maintenance \$6,000 first year, decreases \$400 per year.

Electricity: \$3,000 first year, increases 4% per year.

Salvage value of \$800 at end of tenth year

Motor #1

(9 pts.) Cost = _____

Motor #2

(9 pts.) Cost = _____

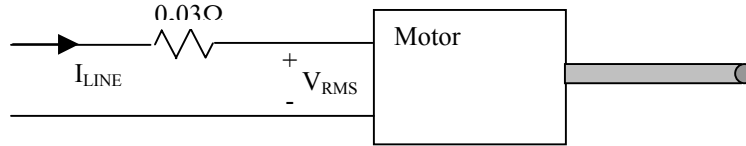
(2 pts.) Cheapest Motor # _____

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Problem 2. (18 points)

For this problem an interest rate of 6% is appropriate. The ac single phase motor operates at a rated line voltage of 220 volts RMS, and has an input power of 60 KW, a power factor of .8 lagging and an efficiency of 75%. The purchase cost of the motor is \$40,000, and the motor has negligible salvage value.



- A. (6 points) Determine the electrical operating cost for one year for the motor, assuming that it operates 300 days per year, 8 hours per day, and at an electrical rate of \$.06 per KW-hr.

Cost = _____

- B. (6 points) Determine the cost of the energy dissipated in the line resistance for one year, assuming the same rate.

Cost = _____

- C. (6 points) It is proposed that the purchase price of the motor be paid in 9 equal annual payments, the first payment occurring immediately. Determine the amount of each payment.

Amount of each payment = _____

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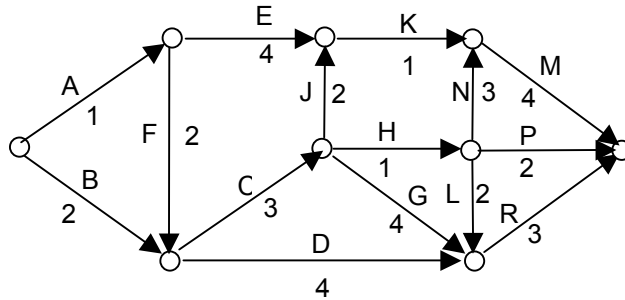
Problem 3. (16 points)

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 variations in time for each activity
 - (d) Gantt charts more clearly illustrate the design process
 - (e) Gantt charts allow for indication of reporting requirements
- B. The rooftop portion of the Quality Function Deployment diagram indicates primarily
- (a) which product characteristics are most important to the consumer
 - (b) which engineering attributes are the result of which stated consumer desires
 - (c) The tradeoffs and correlations among the engineering characteristics
 - (d) The engineering characteristics that cause the most difficulty in manufacture.
- C. The design methodology discussed in Recitation #2 (PowerPC computer design case study) was primarily discussed as an example of
- (a) modularity of design.
 - (b) decomposition of design.
 - (c) staggered parallelism of design.
 - (d) development of a prototype.
- D. A manufacturing process has an average defect rate of 1.4 defects per unit. Determine the probability that a particular unit will have less than two defects.
- (a) 24.2%
 - (b) 24.7%
 - (c) 34.5%
 - (d) 59.2%
 - (e) 83.4%

Problem 4. (14 points)

- A. (8 points) Determine the critical path, and its duration, for the following CPM chart. State the path in terms of activity letters in order from start to finish. Example: AEKM, duration=10



Path and Duration _____

- B. (6 points) Determine the float for

(i) Activity H

Float H = _____

(ii) Activity J

Float J = _____

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Problem 5. (12 points) An electronic production process requires a specific circuit element to have a resistance greater than 6×10^6 ohms. Three batches of 100,000 devices, each device containing exactly one of these joints, are produced, with a mean and standard deviation of

Batch A: mean= 6.5×10^6 ohms
 Standard deviation = 1.5×10^6 ohms

Batch B: mean= 7.2×10^6 ohms
 Standard deviation= 10^6 ohms

Batch C: mean= 8.5×10^6 ohms
 Standard deviation= 2.5×10^6 ohms

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

Batch _____

Number= _____

Name: _____

Student #: _____

Problem 6. (20 points)

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

- A. The effective rate of interest is usually greater than the nominal rate for a given calculation. **TRUE** **FALSE**
- B. The book value of a piece of capital equipment is always less than the market value. **TRUE** **FALSE**
- C. Regular semiannual payments occur four times more often than do regular biennial payments. **TRUE** **FALSE**
- D. When the Payback Period method of project comparison is used, future investment returns are related to the initial cost using the P/F factor. **TRUE** **FALSE**
- E. In group decision-making, the number of possible communication interactions is linearly proportional to the number of group members. **TRUE** **FALSE**