

ME470 Systems Design Final Exam Review

Ethics:

You should be able to read a scenario (one to three paragraphs) and evaluate it with respect to the ASME Code of Ethics. Determine which canons apply to the scenario and justify your choice.

Economics: Be able to

- Generate a cash flow diagram from provided information.
- Generate a depreciation table for straight line, declining balance, and sum of the years digits methods.
- Determine the present value of money received at some future date (e.g. What is the value today of a \$275,000 payment made 30 years from today?).
- Use net present value to compare choices.
- Generate a spreadsheet from a cash flow diagram and use that to calculate a net present value
- Determine the periodic payment that is required to repay a loan with known principal, time period, and interest rate.
- Describe the difference between interest rate and discount rate.
- Use probabilities and present values of different consequences to evaluate a probabilistic net present value.

Statistics: Be able to

- Evaluate normality of data using Anderson Darling
- Explain the meaning of “P-value” with respect to confidence level regarding hypothesis testing.
- Compare using ANOVA to see if two or more samples are from the same population.
- Explain the difference between control limits and specification limits (LCL-UCL vs LSL-USL). Which should be larger for standard engineering problems?
- Explain what it means for a process to be “in control”.
 - State a “good value for C_p , C_{pk} ”
 - Be able to use Minitab to check for “special causes”

DOE: Be able to

- Explain Factor, Level, and Response for a designed experiment.
- Describe what DOE is good for and perform the tasks in Minitab to generate those useful results.
 - Describe what info you get from a screening test and be able to generate and interpret a Pareto Chart.
 - Describe what interactive effects are and be able to generate an interactive effects plot and use it to determine if factors are interactive.
 - Describe the predictive equation that comes from a DOE and be able to generate the equation and explain the terms

- Use the response optimizer to determine the value of the factors needed to achieve a desired response.

Robust Design: Be able to

Apply the main effects plots and the interactive effects plots to minimize variability in a response.

Use the response optimizer to both find the factors to hit a target and minimize variability.

Design Methodologies: Be able to

- Explain the difference between set-based design and point-based design.
- Name the advantages of different design approaches including
 - Set-based design
 - TRIZ
 - Functional Analysis
- Apply functional analysis/functional decomposition to a particular design (as we did with the water gun and the cordless screwdriver).
 - Create a remove and operate table
 - Create a function table
 - Create a functional flow chart with lines showing flow of material, energy, and signal.

Intellectual Property: Be able to

- State the difference between inventor and an assignee.
- Explain the rule regarding the time between first public release of concept and the time a patent must be filed.
- State the typical cost to get a patent using a law firm.
- State the typical cost to defend/prosecute a patent case in the courts.
- State if patent law violations are a criminal or civil matter.
- State the length of time for patent protection.
- Explain the difference between “right to practice” versus “right to exclude” and which best describes what ownership of a patent gives you.
- State whether the United States is a “first to invent” or a “first to file” country.

Decision Making: Be able to

- State the difference between concept screening and concept scoring.
- Explain the difference between ordinal, interval, and ratio scales.
- Use objective trees to develop weighting factors for decision matrices.
- Define the terms selection criteria, weights, and alternatives.
- Use concept screening to recommend conceptual designs.
- Use concept scoring to recommend conceptual designs.