Review for Midterm

Types of questions
1. True or false questions.
2. Given a partial of SAS output, fill in the missing values, and then answer questions.
3. Identify design(s) if you're given a problem; write statistical model with assumptions, answer questions.

Concepts:
1) Issues in experimental design
2) Nuisance factor and factor of interest
3) Type I & II errors & power
4) Descriptive & inferential statistics
5) Population vs sample
6) Sampling distribution & Central limit theorem
7) Several often used distributions
8) tests on means & variances (1-sample, two-sample)
9) sample size / power determination
10) hypothesis test & confidence interval
11) chapter 3: one-way anova (effect model) / model adequacy checking / contrast / simultaneous confidence intervals /non-parametric ANOVA
12) designs in chapter 4 & corresponding ANOVA models/ model adequacy checking
13) chapter 5: factorial designs – only concepts
14) **factorial design (ch 5)**
    - **interaction**
    - **statistical models, assumptions, hypothesis testing, F statistic**
    - **estimate the parameters in the statistical models**
    - **from a part of computer output: # levels of a factor, # replicates**
    - **Tukey's test for interaction when n=1**

- **Multiple comparisons**
- **Blocking factorial design with stat models, e.g., day as a blocking factor;**

15) **2-level factorial design (ch 6, 7)**
  - **Models and assumptions**
  - **Relation between coefficients in regression model and factor effects in ANOVA (coef * 2 = factor)**
  - R^2 **and** R^2**_adj**
  - **single replicate case for 3 or more factors with** full model **– no test available. How to detect significant factors or interactions? (Qqplot)**
  - **unreplicated 2^k factorial design / confounding in two or four blocks**
  - **how are the term(s) confounded?**

16) **2-level fractional factorial design (ch 8)**
  - **Why need fractional factorial design? Principles**
  - **One-half fraction case**
  - **Defining relation, confounding and alias**
  - **Design resolution (if you're given I=….)**
  - **One quarter fraction case**
  - **How to choose the best design (max resolution & min aberration criteria)**
    e.g. The word length patterns for IV designs 2^{7-2} are {4,4,4}, and {4,4,5} which design is better?

17) **Experiments with random factors (ch 13)**
  - **random factor**
  - **random vs fixed**
  - **models (random or mixed), assumptions, hypothesis tests and interpretation**
  - **estimate the parameters - variances**
  - **write F tests if given a EMS table**

18) **Nested and split-plot design (ch 14)**
  - **Why nested? Nested vs. crossed**

- **Model for nested design (2-stage) & assumptions**
- **Why split-plot? Models & assumptions for split-plot design**
- **Whole plot vs. sub-plot**
- **Split-plot vs. nested (in terms of similarity/ dissimilarity?)**
- **Split-plot vs. factorial (in terms of similarity/ dissimilarity?)**

t-table, F-table