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Spring, 2006

Applied Statistics Comprehensive Examination

Statistical Methods I & II

- (30) 1. Suppose you are interested in testing $H_0 : \mu = 200$ versus $H_A : \mu > 200$ and the following decision rule is to be used: Reject H_0 if the average of 100 observations is more than 212. Assume that the population standard deviation is 80.
- (a) Find α for this decision rule.
- (b) Find β for this decision rule if $\mu = 220$.
- (c) Determine the sample size so that $\alpha = 0.05$ and $\beta < 0.10$ for testing $H_0 : \mu = 200$ versus $H_A : \mu = 220$.

- (20) 2. Among 210 persons with alcohol problems admitted to the psychiatric emergency room of a certain hospital, 36 were admitted on a Monday, 19 on a Tuesday, 18 on Wednesday, 24 on a Thursday, 33 on a Friday, 40 on a Saturday and 40 on a Sunday. Use the 0.05 level of significance to test the conjecture that this psychiatric emergency room can expect equally many persons with alcohol problems on each day of the week.

- (30) 3. Three dye formulations for a synthetic fiber are under consideration by a textile manufacturer who wishes to know whether the three formulations differ in quality. The manufacturer conducts an experiment in which five specimens of fabric are cut into three pieces and each piece is then randomly assigned to be dyed by one of the three dye formulations. Each piece of fabric is later graded and assigned a score measuring the quality of the dye. A partially filled out ANOVA table is given below.

Source	df	SS	MS
Dyes		593.73	
Specimens			23.57
Residual			
Total		962.93	

- (a) State an appropriate mathematical model and all of its assumptions. Be sure to state whether the factors are fixed effects or random effects.
- (b) Complete the ANOVA table and make appropriate inferences.
- (c) Suggest a complete set of orthogonal contrasts which could be used for comparing dye formulations.

- (20) 4. Briefly discuss the fundamental differences between a multiple regression model, an analysis of variance model and an analysis of covariance model. Be sure to provide concrete examples of problems that represent the three types of models.