

IE 431 Design of Experiments

First Midterm Exam

Duration 75 min

Date 28 Thul-Qedah 1430 (16/11/2004)

Student Name: _____ Student Number: _____

Question 1 (7 points)

Vitamin D deficiency could be related to the amount of fibre in the diet. Two groups of healthy adults are randomly assigned to one of two diets: Normal or High Fibre. A measure of vitamin D is then obtained for each of the subjects:

Normal Diet	19.1	24.0	28.6	29.7	30.0	34.8	
High Fibre	12.0	13.0	13.6	20.5	22.7	23.7	24.8

Assume that the the two measures of vitamin D are normally distributed and the the variances of the two populations are equal.

- (a) Is there a significance difference between the vitamin D levels of the two groups, use $\alpha = .05$? **(3 points)**
- (b) Find the 95 percent confidence interval on the difference means. **(3 points)**
- (c) Discuss the effect of randomization on the design of experiment? **(1 point)**

Question 2 (13 points)

Fifteen students took part in an experiment to assess the effect of study habits on the retention of material. Three different types of study habit were taken and the fifteen students were randomly assigned to one of these types (treatments)

- Treatment one was a control where the students simply read the material,
- Treatment two involved reading the material and then producing a summary.
- Treatment three involved skimming the material, thinking of key questions and then reading the passage properly.

Each student was then assessed on his knowledge of the material by means of a multiple choice exam. Results were as follows:

Study Habit	Scores				
Control-reading only	22	30	14	28	31
Reading and summary	32	37	42	28	21
Skimming, thinking, reading	44	37	48	35	31

- (1) Does the study method affect the retention of the material? Clearly state the hypothesis and use $\alpha = .05$? **(6 Points)**
- (2) Test all pairs of means using Tukey's method with $\alpha = 0.05$; which study habit provides the best scores for the sample? **(4 Points)**
- (3) Mention the three conditions for the model adequacy; plot the residuals versus the fitted value and show which condition is valid by this plot. **(3 Points)**