

MS Module 12 E(MSTr) practice exam questions

(The attached PDF file has better formatting.)

- An experiment has five groups with 7 observations in each group.
- The five groups have the same population variance $\sigma^2 = 2.1$
- An analysis of variance is done on the five groups to test the null hypothesis $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$

The true means of the five groups are $\mu_1 = 3.6$, $\mu_2 = 3.2$, $\mu_3 = 7.9$, $\mu_4 = 2.8$, $\mu_5 = 0.6$, but these values are not known.

Question 12.1: Deviations of group means

What are the deviations of the group means from the overall mean?

Answer 12.1: the overall mean = $(3.6 + 3.2 + 7.9 + 2.8 + 0.6) / 5 = 3.62$, so the deviations of the group means from the overall mean are

- $\alpha_1 = 3.6 - 3.62 = -0.02$
- $\alpha_2 = 3.2 - 3.62 = -0.42$
- $\alpha_3 = 7.9 - 3.62 = 4.28$
- $\alpha_4 = 2.8 - 3.62 = -0.82$
- $\alpha_5 = 0.6 - 3.62 = -3.02$

Question 12.2: Expected value of the treatment mean square

What is the expected value of MSTr, the treatment mean square?

Answer 12.2: $E(\text{MSTr}) = \sigma^2 + J/(I-1) \times \sum \alpha_i^2 =$

$$2.1 + (7 / (5 - 1)) \times ((-0.02)^2 + (-0.42)^2 + (4.28)^2 + (-0.82)^2 + (-3.02)^2) = 51.604$$

Question 12.3: Non-centrality parameter

What is the non-centrality parameter for the analysis of variance?

$$\text{Answer 12.3: } 7 \times ((-0.02)^2 + (-0.42)^2 + (4.28)^2 + (-0.82)^2 + (-3.02)^2) / 2.1 = 94.293$$