TOPIC 3: INFERENCES FOR SEVERAL POPULATIONS

3.2 One way ANOVA Hypothesis Test

Research Problem: Comparing Several Population Means Using Independent Sample Design

(b) What is the best estimate for the common or pooled standard deviation of the 6 populations?

$\hat{\mu} = S_p = \sqrt{\text{MSE}} = \sqrt{\frac{\text{SSE}}{n-k}} = \sqrt{\frac{3343.875}{48-6}} = 8.922784$

(c) At the 5% significance level, carry out the most appropriate test to determine if there is any significant difference in mean SBP between the 6 groups\

Step 1: Done in (a)

Step 2:
H_0 : $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5 = \mu_6$ (one-mean model)
H_a: Not all 6 means are equal (6-mean model)

n = total sample size = 48
k = number of groups being compared = 6

$$F = \frac{SS_{treatment}/(k-1)}{SS_{error}/(n-k)} = \frac{MS_{treatment}}{MS_{error}} = \frac{2657.104/(6-1)}{3343.815/(48-6)} = 6.675$$

$df = (k-1, n-k) = (6-1, 48-6) = (5, 42) \approx (5, 40)$
P < 0.001, there is extremely strong evidence against H_0
P < α (0.05), therefore reject H_0

Conclusion: At the 5% significance level, the data provide sufficient evidence to conclude that there is a difference in the mean between 6 groups (at least 2 means are different).