

Uva Wellassa University, Sri Lanka
End Semester Examination – September/ October 2012
SCT 202-2 Statistical Methods & Repeat



Time: Two (02) hours

Part C- Essay Questions

Answer all questions.

Marks allocation: 50 Marks

01. Two suppliers manufacture a plastic gear used in a laser printer. The impact strength of these gears measured in Nm^{-2} is an important characteristic. A random sample of 10 gears from supplier 1, and another random sample of 16 gears from the second supplier were collected.

Supplier 1	Supplier 2
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$\bar{x}_1 = 290$	$\bar{x}_2 = 321$
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$s_1 = 12$	$s_2 = 22$
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- a) Is there evidence to support the claim that supplier 2 provides gears with higher mean impact strength? Use $\alpha = 0.05$, and assume that both populations are normally distributed and the variances are equal. (10 Marks)
- b) Reconsider the situation in part (a). Construct a 95% confidence interval estimate for the difference in mean impact strength, and explain how this interval could be used to answer the question posed regarding supplier to- supplier differences. (10 Marks)
02. Three machines A, B, and C are used to produce the same part, and their outputs are collected in a single bin. Machine A produced $\frac{5p}{2}\%$ of the parts in the bin, machine B produced $\frac{15p}{2}\%$, and machine C produced $10p\%$. The parts produced by machine A, 8% are defective. Similarly, 5% of the parts from B and 4% from C are defective. A part is picked at random from the bin.
- a) Show that the value of p is 5 providing the probability of producing defective parts in machines is 0.04875. (05 Marks)
- b) If the part is defective, what is the probability it was produced by machine A? (05 Marks)

03. A computer scientist is investigating the usefulness of two different design languages in improving programming tasks. Twelve expert programmers, familiar with both languages, are asked to code a standard function in both languages, and the time (in minutes) is recorded. The data follow:

Programmer	Time		Difference $d = x - y$
	Design Language 1 (x)	Design Language 2 (y)	
1	17	18	-1
2	16	14	2
3	21	19	2
4	14	11	3
5	18	23	-5
6	24	21	3
7	16	10	6
8	14	13	1
9	21	19	2
10	23	24	-1
11	13	15	-2
12	18	20	-2

- a) Compute the mean (\bar{d}) and standard deviation (S_d) of time difference of two design languages. (05 Marks)
- b) Construct a 95% confidence interval on the difference in mean coding times. (05 Marks)
- c) Is there any indication that one design language is preferable, test with 0.05 significance level? (10 Marks)

Hint: $\bar{d} = \frac{\sum d_i}{n}$

$$S_d^2 = \frac{\sum (d_i - \bar{d})^2}{n-1} = \frac{\sum d_i^2 - n\bar{d}^2}{n-1}$$

$$U_{Cal} = \frac{\bar{d} - \mu_{d0}}{SE(\bar{d})} \sim t_{df}$$

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