BINDURA UNIVERSITY OF SCIENCE EDUCATION

SFM 122: INTRODUCTION TO STATISTICS EXAMINATION

Time: 3 hours

## SECTION A (40 Marks)

Candidates may attempt ALL questions being careful to number them A1 to A5

A1. State the conditions in which you can make an inference about a population mean [8]

A2. A recent large survey of a random sample of Australian children asked about weekly hours of internet use in three age groups. The following table shows the mean and standard deviation of the number of hours of internet use per week and the total number of children surveyed for each age group.

Internet Use

| Age Group (years) | Mean(hours/week) | Standard Deviation | Number surveyed |
|---|---|---|---|
| 5-8 | 3.29 | 4.29 | 2150 |
| 9-11 | 5.75 | 6.17 | 2350 |
| 12-14 | 9.95 | 7.81 | 1250 |

Calculate an approximate 95% confidence interval for the mean number of hours of internet use per week in each group. [12]

A3. Calculate Mean, Median, Mode from the following data
3,13,11,15,5,4,2,3,2 [6]

A4. Felipe surveyed some of the students at his school. He found that 78 students own a cell phone and 57 of those students own an MP3 player. There are 13 students that do not own a cell phone, but own an MP3 player. Nine students do not own either device. Construct a two-way

table summarizing Felipe's data and show the relative frequency of students who own a cell phone who also own an MP3 player. [5]

A.5 A random sample of 10 individuals drawn from the population of interest has a mean of 27.

(a) Assuming that the population is approximately normally distributed with variance 20, can we conclude that the mean is different from 30 years ? ($\alpha$=0.05). [7]

(b) If the p - value is 0.0340 how can we use it in making a decision? [2]

## SECTION B (60 Marks)

Candidates may attempt 2 questions being careful to number them B6 to B8

B6. Use the least square method to determine the equation of line of best fit for the data. Then plot the line. [30]

| x | 8 | 2 | 11 | 6 | 5 | 4 | 12 | 9 | 6 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| y | 3 | 10 | 3 | 6 | 8 | 12 | 1 | 4 | 9 | 14 |

B7

a) In a comparison of a cleaning action of four detergents, 20 pieces of white cloth were first soiled with India ink, The clothes were then washed under controlled conditions with 5 pieces washed by each of the detergents. Unfortunately three pieces of cloth were 'lost' in the course of the experiment. Whiteness readings, made on the 17 remaining pieces of cloth are as shows below.

Detergents

| A | B | C | D |
|---|---|---|---|
| 77 | 74 | 73 | 76 |
| 81 | 66 | 78 | 85 |
| 61 | 58 | 57 | 77 |
| 76 | | 69 | 64 |
| 69 | | 63 | |

Assuming all whiteness readings to be normally distributed with common variance, test the hypothesis of no difference between the four brands as regards mean whiteness readings after washing. [15]

b) The Table below shows the lifetimes under controlled conditions in hours excess of 1000 hours of samples of 60W electric light bulbs of three different brands.

| Brand 1 | Brand 2 | Brand 3 |
|---|---|---|
| 16 | 18 | 26 |
| 15 | 22 | 31 |
| 13 | 20 | 24 |
| 21 | 16 | 30 |
| 15 | 24 | 24 |

Assuming all lifetimes to be normally distributed with common variance, test at the 1% significance level, the hypothesis that there is no difference between the three brands with respect to mean life. [15]

B8. A recent large survey of Australian households estimated the average weekly household expenditure on clothing and footwear to be $44.50, with a standard deviation of $145.80. The margin of error was reported to be $2.90, for a 95% confidence interval.

i) What shape is the distribution of weekly household expenditure on clothing and footwear likely to be? [5]
ii) Is the shape of the distribution of weekly household expenditure on clothing and footwear a concern, if you wish to estimate the true mean of weekly household expenditure on clothing and footwear?[5]
iii) Based on the information provided, approximately how many households were surveyed? [5]
iv) Find a 95% confidence interval for the true mean weekly household expenditure on clothing and footwear. [5]
v) Use the results of this survey to estimate the mean yearly household expenditure on clothing and footwear. What is the 95% confidence interval? [5]

END OF EXAM