Reg. No. : | | | | | | | | | | |

Z 4501

M.B.A. DEGREE EXAMINATION, MAY/JUNE 2008.

First Semester

BA 1601 — STATISTICS FOR MANAGEMENT

(Regulation 2005)

Time : Three hours Maximum : 100 marks

(Codes/Tables/Charts to be permitted, if any may be indicated)

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. How is Bayes's theorem used?

2. State the assumptions that pertain to the binomial distribution.

3. What is the essence of the central limit theorem?

4. Contrast a point estimate with an interval estimate.

5. Define the terms (a) Null hypothesis (b) Level of significance.

6. What is the purpose of a goodness-of-fit test?

7. State the purpose of Mann-Whitney test.

8. Contrast the sign test with the ranked sign test.

9. Give four components of a Time Series.

10. When do regression lines coincide and perpendicular to each other?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Suppose we have four bowls of colored marbles, with 10 marbles in each bowl. The table below summarizes the composition of the bowls.

Marble color

	Red	White	Blue	Total
A	1	6	3	10
B	6	2	2	10
C	8	1	1	10
D	0	6	4	10

One of the bowls has been arbitrarily selected and a single marble drawn from that bowl. If the marble is red, what is the probability that is was drawn from bowl B? (10)

(ii) Find the probability of 4 defectives in a sample of 300 taken from a large lot if there are 2% defective in the lot. (6)

Or

(b) Bharat Ltd., manufactures blades of which 0.2% turn out to be defective. The blades are packed in cases each containing 1000 blades. A wholesaler purchases 2000 such cases. In how many of them (approximately) he may expect to have :

(i) No defectives. (2)

(ii) Only one defective. (2)

(iii) Only tow defective. (2)

(iv) Only three defective. (2)

(v) Atleast two defective. (2)

(vi) More than two defectives. (2)

(vii) Between one and three defectives (both inclusive). (2)

(viii) At the most two defectives. (2)

12. (a) (i) A very large population has a mean of 20.0 and a standard deviation of 1.4. A sample of 49 observations are taken. Answer these questions :

(1) What is the mean of the sampling distribution? (1)

(2) What is the standard deviation of the sampling distribution? (3)

(3) What percentage of possible sample means will differ from the population mean by more than 0.2? (5)

(ii) A manufacturer of car batteries claims that its premium line batteries have an expected (Average) life of 50 months. It is known that the standard deviation of battery life is 4 months for premium batteries made by this company. What percentage of samples of 36 observations will have an average mean life within 1 month of 50 months, assuming 50 is the true average life of the batteries? What is the answer if a sample of 64 observations is taken? (7)

Or

(b) (i) What sample size would be necessary to achieve a 95% confidence interval for the population proportion if the tolerable error is .08? (5)

(ii) Determine a 95% confidence interval for this situation.

	Here
$\bar{x} = 15.0$	Mean = $\bar{x}$
$\sigma_x = 2.0$	σ_x = standard deviation
$n = 100$	n = sample size
$N = 100$	N = lot size

(6)

(iii) A sample of 200 observations has produced 20 defectives in a shipment of batteries. Using a confidence of 99%, find the estimation error. (5)

13. (a) (i) σ_x is known, use $\alpha = .05$ (α = significance level)

$H_0 : \mu_1 = \mu_2$ $\quad$ $H_1 : \mu_1 > \mu_2$

mean of sample 1 = $\bar{x}_1 = 20$ $\quad$ $\bar{x}_2 = 18$ = mean of sample 2

$\sigma_1 = \sigma_2 = 3$, $\quad$ σ_1 = standard deviation of population 1

$n_1 = n_2 = 36$ $\quad$ σ_2 = standard deviation of population 2

n_1 – sample size of population 1 $\quad$ n_2 – sample size of population 2

Compute the test statistic. (7)

(ii) σ_x is unknown, test the hypothesis

$H_0 : \mu_1 = \mu_2$

when the alternative is

$H_1 : \mu_1 \neq \mu_2$

use $\alpha = 0.05$ and

$S_{x_1} = 1.1$ $\quad$ $S_{x_2} = 1.2$

$\bar{x}_1 = 5.4$ $\quad$ $\bar{x}_2 = 5.0$

(1) Use $n_1 = n_2 = 36$

(2) Use $n_1 = 15$, $n_2 = 3$ (assume a normal population) (9)

Or

(b) (i) A machine which fills and caps bottles of soft drinks is said to produce bottles with a mean of 1 liter and a standard deviation of .2 liters. Moreover, it is claimed the distribution of the amount of soft drinks per bottle is normally distributed. One hundred bottles have been examined and the amount of soft drinks per bottle recorded. Test the claim, using the .025 level of significance. (8)

(ii) A manufacturer claims a shipment of finishing nails contains less than 1% defective. A random sample of 200 nails contains 4 (i.e. 2%) defectives. Test this claim at the .01 level. (8)

14. (a) Compare the mean typing speeds of two groups of business school students. Group 2 learned typing by using a traditional approach, while group 1 learned by typing blindfolded. Test the claim that the blindfolded students did wrose, using $X = 0.05$. (16)

Group 1 (words/min)	Group 2 (words/min)
36.0	38.2
32.5	40.1
41.3	29.8
40.1	30.3
50.8	32.8
39.2	40.4
41.2	37.2
29.7	34.1
32.5	36.2
37.8	41.5
46.6	35.5
	42.5
	44.9

Or

(b) (i) The following data relate to the daily production of cement (in m. tonnes) a large plant for 30 days :

11.5	10.0	11.2	10.0	12.3	11.1	10.2	9.6	8.7	9.3
9.3	10.7	11.3	10.4	11.4	12.3	11.4	10.2	11.6	9.5
10.8	11.9	12.4	9.6	10.5	11.6	8.3	9.3	10.4	11.5

Use sign test to test the null hypothesis that the plant's average production of cements 11.2 m tonnes against alternative hypothesis $\mu < 11.2$ m tonnes at the 0.05 level of significance. (8)

(ii) The Ajax Insurance corporation has been operating a sales refresher course designed to improve the performance of its sales representatives. A number of classes have completed the course. In an attempt to assess the value of the program, the sales training manager wants to determine if there's a relationship between performance in the program and subsequent performance in generating Annual sales. The data collected by the sales training manager on 11 program graduates is given below :

Sales person	Course performance Rank	Annual sales Rank
Steele	1	4
Spin	2	6
Devine	3	1
Hanlon	4	2
McCabe	5	7
Braman	6	10
Seville	7	3
McNally	8	5
Reid	9	8
Silva	10	9
Could	11	11

Find the correlation between course performance and subsequent sales activity.

15. (a) (i) Obtain the two regression lines from the following data :

x	22	26	29	30	31	31	34	35
y	20	20	21	29	27	24	27	31

Also compute the coefficient of linear correlation, using the standard errors of estimates. (10)

(ii) What are the components of time series? Explain with an example. (6)

Or

(b) (i) Calculate the quarterly seasonal indices in respect of the following data by using the simple average method. (10)

Year	Quarter I	Quarter II	Quarter III	Quarter IV
2000	71	68	79	71
2001	76	69	82	74
2002	74	66	84	80
2003	76	73	84	78
2004	78	74	86	82

(ii) Find the two regression equations if

$\overline{X} = 53, \quad \overline{Y} = 28 \quad b(Y \text{ on } X) = -1.5$

$b(Y \text{ on } X) = -0.2.$ (6)

———————