



## BRAINWARE UNIVERSITY

Course – MBA

Advanced Statistics (MBA203 / MBA203(BL))

(Semester – 2)

**Time allotted: 3 Hours**

**Full Marks: 70**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

### Group –A

(Multiple Choice Type Question)

10 x 1 = 10

1. *Choose the correct alternative from the following*
  - (i) A parameter is
    - a. A sample characteristic
    - b. A population characteristic
    - c. Unknown
    - d. Normally distributed
  - (ii) Two events are mutually exclusive if
    - a. They are exclusively connected
    - b. They can't occur together
    - c. they exclusively include mutuality
    - d. None of these
  - (iii) When asked questions concerning personal hygiene, people commonly lie. This is an example of:
    - a. Sampling bias
    - b. Confounding
    - c. Non response bias
    - d. Response bias
  - (iv) The distribution of heights of American women aged 18 to 24 is approximately normally distributed with a mean of 5.5 inches and standard deviation of 2.5 inches. Calculate the z - score for a woman six feet tall.
    - a. 0.2
    - b. 0.3
    - c. 0.4
    - d. 0.5
  - (v) For a normal curve with  $\mu = 55$  and  $\sigma = 10$ , how much area will be found under the curve to the right of the value 55?
    - a. 1.0
    - b. 0.68
    - c. 0.50
    - d. 0.32

- (vi) For a two tailed test of hypotheses at  $\alpha = 5\%$ , the acceptance region is the entire region
- To the right of the negative critical value
  - Between the two critical values
  - Outside of the two critical values
  - To the left of the positive critical value
- (vii) Suppose we wish to test whether a population mean is significantly larger or smaller than 10. We take a sample and find sample mean as 8. What should our alternative hypothesis be?
- $\mu < 10$
  - $\mu \neq 10$
  - $\mu > 10$
  - Can't be determined
- (viii) Suppose that 200 members of a group were asked whether they like a particular product. 50 said yes; 150 said no. Assuming 'yes' means success, which of the following is correct?
- $P = 0.33$
  - $P = 0.25$
  - $P = 0.66$
  - $P = 0.50$
- (ix) Which of the following is a necessary condition for using a t distribution table?
- n is small
  - s is known but  $\sigma$  is not
  - The population is finite
  - All of these
- (x) A chi square value can never be negative because:
- Differences between expected & observed frequencies are squared
  - A negative value would mean that the observed frequencies were negative
  - The absolute value of the differences is computed
  - All of these

### Group – B

(Short Answer Type Questions)

3 x 5 = 15

Answer any *three* from the following

- What are the properties of binomial distribution? [5]
- What are the conditions of conducting z test and t test? [5]
- A salesperson has a 10% chance of making a sale to any customer who is called upon. If 20 calls are made, what is the chance that fewer than three sales are made? [5]
- What is standard error of sample mean? Give example. [5]
- Shafts made by an automatic machine are normally distributed and have a standard deviation of 0.02 mn. A sample of four shafts has a mean diameter of 25.01 mn. Construct a 95% confidence interval estimate of the mean diameter of all shafts made by the machine. (Z value at 95% confidence interval is 1.96) [5]

**Group – C**

(Long Answer Type Questions)

3 x 15 = 45

Answer any *three* from the following

7. (a) Explain Hypothesis testing. [5]  
 (b) What are the steps involved in hypothesis testing? [5]  
 (c) Discuss the two types of errors in testing of hypothesis. [5]
8. Write short notes on the following [5 x 3 = 15]  
 (a) Characterization of probability. [5]  
 (b) Central Limit Theorem [5]  
 (c) Sources of secondary data [5]
9. (a) Movie theaters know that a certain hit movie ran an average of 84 days in each city and the corresponding standard deviation was 10 days. The manager of the southeastern district was interested in comparing the movie's popularity in his region with that in all of rest of the other theaters. He randomly chooses 75 theaters in his region and found that they ran the movie an average of 81.5 days. At 1% significance level tests these hypotheses. (Z value at 1% significance level is 2.58) [5]
- (b) A psychologist surveyed 150 top executives and found that 42% of them were unable to add fractions correctly. Construct a 95% confidence interval for the true proportion of top executives who cannot correctly add fractions. (The value of 95% confidence interval is 1.96). [5]
- (c) Given a sample mean of 94.3, a sample standard deviation of 8.4 and a sample size of 6, test the hypothesis that the value of the population mean is 100 against the alternative hypothesis that it is less than 100. Use the 0.02 level of significance. ( $t_{\alpha} = 3.143$ ) [5]
10. (a) To test the effectiveness of training, a group of 5 participants were selected and given a test before and after the training. The result of the tests was as under:
- |                       |    |    |    |    |    |
|-----------------------|----|----|----|----|----|
| Participants          | 1  | 2  | 3  | 4  | 5  |
| Score before training | 10 | 12 | 15 | 18 | 10 |
| Score after training  | 15 | 10 | 18 | 32 | 25 |
- Can the training be regarded as effective at 5% level of significance? (t value at 5% level of significance with 4 degrees of freedom is 2.13) [10]
- (b) A normal population has a standard deviation of 10. A random sample of size 25 has a mean of 50. Construct a 95% confidence interval estimate of the population mean. (z value at 95% confidence interval is 1.96) [5]

11. An automobile company gives you the following information about age-groups and the liking for a particular model of car which is expected to be introduced :

Persons	Age				Total
	$\leq 20$	20 – 39	40 – 59	$\geq 60$	
Liked the car	140	80	40	20	280
Disliked the car	60	50	30	80	220
Total	200	130	70	100	500

On the basis of this data, can it be concluded that the model appeal is independent of the age groups? (given  $\chi^2 = 7.815$ )

[15]