

Name :

Roll No. :

Invigilator's Signature :

CS/MBA(New)/SEM-2 (FT & PT)/MB-203/2011

2011

QUANTITATIVE METHODS-II

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$$10 \times 1 = 10$$

i) The process of using sample statistics to draw conclusions about true population parameters is called

- a) statistical inference
- b) the scientific method
- c) sampling
- d) descriptive statistics.

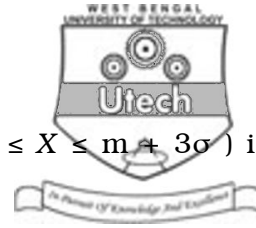
ii) Probability of having least one 'six' from 3 throws of an unbiased die is

- | | |
|---------------------------------|-------------------------------------|
| a) $\left(\frac{5}{6}\right)^3$ | b) $1 - \left(\frac{5}{6}\right)^3$ |
| c) $\frac{1}{6^3}$ | d) none of these. |

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iii) Let $X \sim N(\mu, \sigma^2)$, then $P(\mu - 3\sigma \leq X \leq \mu + 3\sigma)$ is equal to

- a) 0.6827 b) 0.9545
- c) 0.9973 d) none of these.

iv) Let T_n be a statistic to estimate the population parameter θ . Also let $E(T_n) = \theta + 5$, then T is

- a) unbiased b) biased
- c) efficient d) none of these.

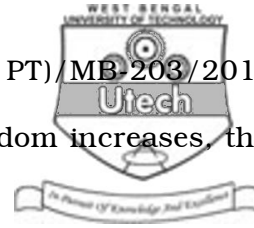
v) Type-I error can be related as

- a) consumer's risk
- b) producer's risk
- c) manager's risk
- d) none of these.

vi) $\text{Cov}(X, Y) = 0$ implies

- a) X and Y are independent
- b) X and Y are dependent
- c) there is no linear relationship between X & Y
- d) none of these.

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- vii) For a t-distribution, as degree of freedom increases, the distribution approaches to
- a) Binomial distribution b) Normal distribution
- c) Poisson distribution d) None of these.
- viii) The following sample of weights is drawn from a normal population : 45, 48, 49.5, 46.5, 47, 46, 45.5 and 50. Then, the unbiased estimator of population mean will be
- a) 47.1 b) 377.5
- c) 50 d) cannot be determined.
- ix) To test goodness of fit for a non-normal population, we use
- a) Kolmogorov-Smirnov Test
- b) Kruskal-Wallis test
- c) Sign test
- d) χ^2 test.
- x) The values of test statistic which leads to the rejection of null hypotheses is called
- a) confidence level b) p -value
- c) critical region d) level of significance.

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xi) The standard deviation of the sampling distribution of a statistic is referred to as

- a) standard error b) sampling error
- c) mean error d) none of these.

xii) Which of the following components is used for short-term forecast ?

- a) Cyclical b) Trend
- c) Seasonal d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

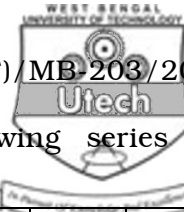
2. The mean yield for one acre plot is 662 kilos with standard deviation 32 kilos. Assuming normal distribution, how many one-acre plots in a batch of 1000 plots would you expect to have yielded

- (i) over 700 kilos ?
- (ii) below 650 kilos ?
- (iii) What is the lowest yield of the best 100 plots ?

$$[p (0 \leq Z \leq 0.38) = 0.1480 \text{ and if,}$$

$$p (0 \leq Z \leq z_1) = 0.4 \Rightarrow z_1 = 1.28]$$

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3. Fit a linear trend equation to the following series on production data :

Year	1961	1962	1963	1964	1965	1966
Production(tons)	21	37	48	56	62	69

Also estimate the production in the year of 1970.

4. The scores under two conditions X and Y obtained by the respondents are given below :

X	12	16	8	6	4	8
Y	7	12	17	5	12	11

Apply the sign test and comment on your findings at 0.05 level of significance.

5. Write a short note on Factor Analysis.
6. The mean life time of a sample of 100 fluorescent tubelights produced by a company is computed to be 1570 hrs with s.d. of 120 hrs. The company claims that the average life of the tubes produced by the company is 1600 hrs. Using the level of significance of 0.05 is the claim acceptable ?
(Given $|z|$ at 5% level = 1.96).
7. Discuss the difference between parametric and non-parametric tests.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. The following table shows the lives in hours of four batches of electric lamps :

Batches

1.	1600	1610	1650	1680	1700	1720	1800	—
2.	1580	1640	1640	1700	1750	—	—	—
3.	1460	1550	1600	1620	1640	1660	1740	1820
4.	1510	1520	1530	1570	1600	1680	—	—

Perform an analysis of variance of these one way classified data and show that a significance test does not reject their homogeneity.

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9. a) If 'T' is an unbiased estimator for θ , show that T^2 is biased estimator for θ^2 . 5

- b) Show that $\frac{[\sum x_i (\sum x_i - 1)]}{n(n-1)}$ is an unbiased estimate of θ^2 , for the sample x_1, x_2, \dots, x_n drawn on X which takes the values 1 or 0 with respective probabilities θ and $(1 - \theta)$. 5

- c) Given x_1, x_2, \dots, x_n is a random sample from a normal population $N(\mu, 1)$. Show that $t = \frac{1}{n} \sum_{i=1}^n x_i^2$ is an unbiased estimator of $\mu^2 + 1$. 5

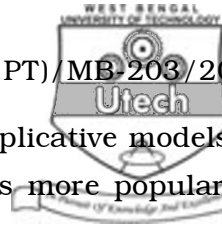
10. a) Make a sign test for the following paired sample data and comment on the difference between the hindleg lenth and foreleg lenth of deers.

Deer	1	2	3	4	5	6	7	8	9	10
Hindleg (cm)	142	140	144	144	142	146	149	150	142	148
Foreleg (cm)	138	136	147	139	143	141	143	145	136	146

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- b) A company believes that it hold about 30% share of the colour TV makret in a city. The company wishes to get a precise estimate of its share within a margin of error of 2%. How large a number of households should be surveyed to get the desired estimate with a confidence of 95% ? If the cost of contacting a household is Rs. 20, what will be total cost of the survey ? If the budget for this survey is limited to Rs. 10,000, what accuracy can be obtained by a survey within this budget ? 7

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11. a) Explain briefly the additive and multiplicative models of time series. Which of these models is more popular in practice and why ? 5

- b) Assume a 4-year cycle and calculate the trend by the method of moving average from the following data :

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Production (million lbs)	464	515	518	467	502	540	557	571	586	612

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12. a) Define critical region, Errors of Type-I & Type-II and power of a test. 4

- b) Let $W = \{ x : x \geq 1 \}$ is the critical region for testing the Hypothesis

$$H_0 : \theta = 1$$

$$H_1 : \theta = 2$$

on the basis of a single observation from the population

$$f(x, \theta) = \theta e^{-\theta x}, x \geq 0.$$

Calculate type-I error, type-II error and power of the test. 5

- c) Obtain 95% confidence interval for the population parameter λ of the Poisson distribution

$$f(x, \lambda) = \frac{e^{-\lambda} \lambda^x}{x!} . \quad 6$$

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