



Name :

Roll No. :

Invigilator's Signature :

CS/MBA (NEW)/SEM-2 (FT&PT)/MB-203/2010

2010

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 :

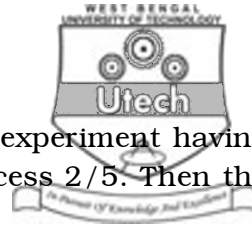
10 × 1 = 10

i) A random variable following normal distribution has mean = 12 and variance = 9. The Z value for sample mean value less than 16 is

- a) 4
- b) 0.44
- c) 1.33
- d) 1.

ii) The binomial distribution can be approximated by a Poisson distribution if

- a) n is small and p is large
- b) n is large and p is small
- c) n is small and p is also small
- d) n is large and p is also large.



- iii) 10 trials are conducted in a random experiment having two outcomes with probability of success $2/5$. Then the mean of the variable would be
- a) 10 b) $2/5 \times 3/5$
c) 4 d) cannot be determined.
- iv) If $x \rightarrow N(0, 1)$ then $P(x > 0)$ is
- a) $\frac{1}{2}$ b) $\frac{1}{4}$
c) 1 d) 0.
- v) If the range of a uniform distribution is 5 to 10, then its mean is
- a) $5/2$ b) $15/2$
c) $10/2$ d) $15/5$.
- vi) If a true null hypothesis is rejected then
- a) Type I error is committed
b) Type II error is committed
c) the hypothesis is wrong
d) data was incorrect.
- vii) Which of the following is not a component of time series ?
- a) Seasonal b) Cyclical
c) Trend d) Statistical.
- viii) To test equality of means of more than two populations, not normally distributed, we use
- a) Rank test
b) Mann-Whitney test
c) Kruskal-Wallis test
d) Kolmogorov-Smirnov test.



- ix) If mean and variance of a binomial distribution are 5 and 4 respectively, the value of n is
- a) 15 b) 10
 c) 20 d) 25.
- x) Suppose that a population with $N = 144$ has $\mu = 24$. What is the mean of the sampling distribution of the mean for samples of size 25 ?
- a) 24
 b) 2
 c) $4 \cdot 8$
 d) Cannot be determined from the information given.
- xi) Advantage of sampling is that it
- a) is less costly
 b) is less time consuming
 c) requires less manpower
 d) is always more accurate.
- xii) Which of the following samples is not probability sample design ?
- a) Stratified sample b) Multistage sample
 c) Cluster sample d) Quota sample.
- xiii) 95% confidence limits for mean are
- a) $\bar{x} \pm 1.96 \sigma / n^2$ b) $\bar{x} \pm 1.96 \sigma / n$
 c) $\bar{x} \pm 1.96 \sigma^2 / n$ d) $\bar{x} \pm 1.95 \sigma / n^2$.



- xiv) A chi-square value can never be negative because
- the observed frequencies cannot be negative
 - differences between observed and expected frequencies are squared
 - the sum of the differences is computed
 - none of these.

GROUP – B

(Short Answer Type Questions)

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

- Find the probability distribution of number of Tails when a fair coin is tossed repeatedly until the first Head appears.
- Calculate the mean and variance of the R.V x :

x :	8	12	16	20	24
$P(x)$:	1/8	1/6	3/8	1/4	1/12
- Show that variance of Binomial distribution cannot exceed $n/4$ for n independent trials of random experiment.
- Show that
$$f(x) = x; \quad 0 \leq x \leq 1$$
$$= k - x; \quad 1 \leq x \leq 2$$
$$= 0 \text{ otherwise}$$
is a probability distribution function for a suitable value of k and find it.
- For a binomial distribution the mean is 4 and variance is 2. Find the probability of getting.
 - at least 2 successes
 - at most 2 successes.



7. Assuming that on an average 2% of the output in a factory manufacturing certain bolts, is defective and that 200 units are in a package, what is the probability that
- none is defective ?
 - at most 3 defective bolts may be found in that package ? (Given $e^{-4} = 0.0183$)

GROUP - C

(Long Answer Type Questions)

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

8. a) A random sample of size 5 is drawn without replacement from a finite population of size 54. If standard deviation of population is 5.5, what is the standard error of sample mean ?
- b) A manufacturer's ball-point refills have a mean life of 40 pages with an S.D of 2 pages. A purchasing agent selects a sample of 100 pens and put them for test. The mean writing life for the sample was found to be 39 pages. Should the purchasing agent reject the manufacturer's claim at 5% level of significance ? $6 + 9$
9. A random variable X has the following probability distribution :
- | | | | | | | | | | |
|--------|---|----|----|----|----|-----|-----|-----|-----|
| X : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| P(x) : | k | 2k | 4k | 6k | 8k | 10k | 12k | 14k | 16k |
- Determine the value of k.
 - Find $P(X < 3)$; $P(X \geq 3)$; $P(0 < X < 5)$
 - Calculate $E(X)$ and $V(X)$.



10. A farmer applies three types of fertilizers on 4 separate plots. The figure on yield per acre is tabulated below :

Plots	Yield				Total
	A	B	C	D	
Fertilizers	A	B	C	D	Total
Nitrogen	6	4	8	6	24
Potash	7	6	6	9	28
Phosphates	8	5	10	9	32
Total	21	15	24	24	84

Find out if the plots are materially different in fertility, as also, if the three fertilizers make any material difference in yields. Given $F_{0.5(2, 6)} = 5.14$.

11. a) The results of a survey to know the educational attainment among 100 persons randomly selected in a locality are given below :

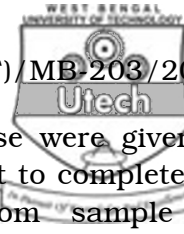
	Education			Total
	Middle	High School	College	
Male	10	15	25	50
Female	25	10	15	50
Total	35	25	40	100

Can you say that education depends on sex ?

(Given $\chi^2 = 5.99$ at d.f. = 2 and $\alpha = 0.05$)

b) A group of 5 patients treated with medicine A weigh 42 kg, 39 kg, 48 kg, 60 kg, 41 kg. A second group of 7 patients from the same hospital treated with medicine B weight 38 kg, 42 kg, 56 kg, 64 kg, 68 kg, 69 kg, 62 kg. Do you agree with the claim that medicine B increases the weight significantly. (The value of t at 5% level of significance for 10 degrees of freedom is 2.2281).

8 + 7



12. Students in an e-business technology course were given a written final examination as well as a project to complete as part of their final grade. For a random sample of 10 students, the scores on both the exam and the project are as follows :

Exam	81	62	74	78	93	69	72	83	90	84
Project	76	71	69	76	87	62	80	75	92	79

Find the Spearman rank correlation coefficient and also test for association. Given critical value of r for $n = 10$ and $\alpha = 0.025$ is 0.648.

13. a) The following table gives all samples of same size, drawn from a population according to criteria for testing the null hypothesis H_0 :

	H_0 true	H_0 false	Total
Reject H_0	5	145	150
Accept H_0	90	10	100
Total	95	155	250

Find

- i) level of significance
 - ii) power of the test
 - iii) critical region.
- b) In order to test whether a coin is perfect, it is tossed 5 times. the null hypothesis of perfectness is rejected if and only if more than 4 heads is obtained. Obtain the
- i) critical region
 - ii) probability of type I error and
 - iii) probability of type II error when the corresponding probability of getting a head is 0.2. 7 + 8

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