QUANTITATIVE METHODS – II (SEMESTER - 2)

CS/MBA (O)/SEM-2 (FT & PT)/MB-203/09
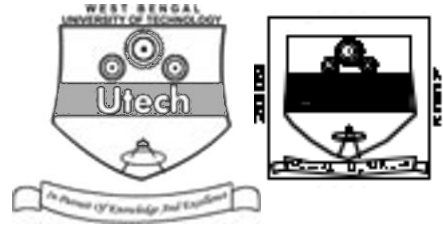
1. ....
   Signature of Invigilator

2. ....
   Signature of the Officer-in-Charge

Reg. No.

Roll No. of the Candidate

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CS/MBA (O)/SEM-2 (FT & PT)/MB-203/09
ENGINEERING & MANAGEMENT EXAMINATIONS, MAY – 2009
QUANTITATIVE METHODS – II (SEMESTER - 2)

Time : 3 Hours]   [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **36 pages**. The questions of this concerned subject commence from Page No. 3.

2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question.**

    b) For **Groups – B** & C you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.

3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.

4. Read the instructions given inside carefully before answering.

5. You should not forget to write the corresponding question numbers while answering.

6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.

7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**

8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.

9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

FOR OFFICE USE / EVALUATION ONLY
Marks Obtained

				Group – A						Group – B	Group – C			
Question Number													**Total Marks**	**Examiner's Signature**
Marks Obtained														

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Head-Examiner/Co-Ordinator/Scrutineer

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ENGINEERING & MANAGEMENT EXAMINATIONS, MAY – 2009
QUANTITATIVE METHODS – II
SEMESTER – 4

Time : 3 Hours]   [Full Marks : 70

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i)   For a Poisson distribution $P(x) = e^{-5} \dfrac{(5)^x}{x!}$, the mean value is

   a)   2   b)   5

   c)   10   d)   none of these.

   ii) For a normal distribution if $\mu = 30$, then its mode is

   a)   15   b)   30

   c)   60   d)   none of these.

   iii) The standard error of the sample mean based on an SRSWOR sample of size n is

   a) $\dfrac{\sigma}{\sqrt{n}}$ b) $\sqrt{\dfrac{N-n}{N-1}} \cdot \dfrac{\sigma}{\sqrt{n}}$

   c) $\sqrt{\dfrac{N-1}{N-n}} \cdot \dfrac{\sigma}{\sqrt{n}}$ d) $\sqrt{1-\dfrac{n}{N}} \cdot \dfrac{\sigma}{\sqrt{n}}$.

   iv) The term $1-\beta$ is called

   a)   level of significance   b)   power of the test

   c)   size of the test   d)   none of these.

   v)   If the two co-efficients of regression are 0·8 and 0·2, then the value of the co-efficient of correlation is

   a)   0·16   b)   – 0·16

   c)   0·40   d)   – 0·40.

vi) Value of c for which $\begin{aligned} f(x) &= cx \text{ for } x = 0,\ 1,\ 2,\ 3,\ 4,\ 5 \\ &= 0 \quad \text{otherwise} \end{aligned}$ becomes a p.m.f. is

   a)   7/15   b)   1/15

   c)   2/15   d)   4/15.

vii) The maximum and the minimum values of the correlation coefficient are

   a)   1, 0   b)   2, 1

   c)   0, – 1   d)   1, – 1.

viii) If X has a binomial distribution with parameters n and p, then its mean is

   a) np b) $n + p$

   c)   1   d) $np(1 - p)$.

ix) If X_i ($i = 1, 2, \ldots, n$) are independent Poisson variates with parameter λ_i ($i = 1, 2, \ldots, n$) respectively, then $\sum_{i=1}^{n} X_i$ is also a Poisson variate with parameter

   a) $\displaystyle\sum_{i=1}^{n} \lambda_i^2$ b) $\displaystyle\sum_{i=1}^{n} \frac{\lambda_i}{n^2}$

   c) $\displaystyle\sum_{i=1}^{n} \lambda_i$ d) λ_i.

x)   If X_1, X_2, X_3, X_4 be 4 independent normal variates with means μ_i ($i = 1, 2, 3, 4$) and variances σ_i^2 ($i = 1, 2, 3, 4$), then $\displaystyle\sum_{i=1}^{4}\left(\frac{X_i - \mu_i}{\sigma_i}\right)^2$ is a χ^2- variate with degrees of freedom

   a)   4   b)   3

   c)   2   d)   5.

xi) If 'r' is the observed correlation coefficient in a sample of n pairs of observations from a bivariate normal population, then t-statistic for testing the significance of the correlation coefficient is defined as

   a) $\dfrac{r\sqrt{n-2}}{\sqrt{1-r^2}}$ with ($n - 2$) d.f.   b) $\dfrac{r\sqrt{n}}{\sqrt{1-r^2}}$ with n d.f.

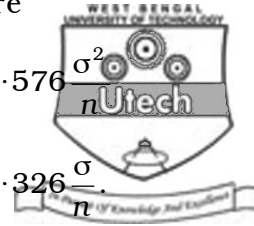   c) $\dfrac{r\sqrt{n-1}}{\sqrt{1-r^2}}$ with ($n - 1$) d.f.   d)   none of these.

xii) 95% confidence limits for population mean (μ) are

a) $\overline{X} \pm 1 \cdot 96 \dfrac{\sigma}{\sqrt{n}}$

b) $\overline{X} \pm 2 \cdot 576 \dfrac{\sigma^2}{n}$

c) $\overline{X} \pm 1 \cdot 645 \dfrac{\sigma^2}{\sqrt{n}}$

d) $\overline{X} \pm 2 \cdot 326 \dfrac{\sigma}{n}$.

xiii) If 3 dice are thrown at once, then the total number of cases are

a) 18

b) 27

c) 216

d) 0.

xiv) If $P (A) = 1/3$, $P (B) = 1/9$, $P (A \cup B) = 1/6$, then the value of $P (A \cap B)$ is

a) 4/9

b) 5/18

c) 5/6

d) 1.

GROUP – B

(Short Answer Type Questions)

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

2. Distinguish between sampling error and non-sampling error.

3. What are the uses of χ^2 distribution ?

4. A random sample of size 100 has mean 15, the population variance being 25. Find the interval estimate of the population mean with a confidence level of 99%.

5. The scores obtained by students of a class follows a uniform distribution with 100 as maximum and 60 as minimum. Find the mean and standard deviation of scores.

6. *X* is a discrete random variate having probability mass function :

x :	0	1	2	3	4	5	6	7
$f (x)$:	0	k	$2k$	$2k$	$2k$	k^2	$2k^2$	$7k^2 + k$

i) Determine the constant k.

ii) Find $P [X < 6]$.

7. Fit a straight line trend equation by the method of least squares and estimate the value for 2011.

Year :	1995	1996	1997	1998	1999	2000	2001	2002
Value :	380	400	650	720	690	600	870	930

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions.   3 × 15 = 45

8. a) Fit a parabolic trend to the following data and hence estimate the sales values for years 2009 and 2010.

Year :	2001	2002	2003	2004	2005
Sales :	32	17	10	11	20

   b) In a box containing 100 transistors, 20 are known to be defective. If any five are chosen at random, what is the probability that

   i)   all are defective

   ii)   only one is defective

   iii) at least one is defective ?   9 + 6

9. a) A sample of 1000 dry cell batteries were tested to find mean life time. They showed a mean life of 120 hours and standard deviation of 30 hours.

   Assuming normal distribution, find the number of cells expected to have a life of

   i)   less than 60 hours.

   ii)   more than 150 hours.

   iii) between 100 and 140 hours.

   b) Assuming that height distribution of a group of men follows normal distribution, find the mean and standard deviation of heights if 84% of men have heights less than 65·2 inches and 68% have heights lying between 65·2 and 62·8 inches.

   c) Show that sample variance is a biased estimator of population variance. 5 + 6 + 4

10. a) From 20,000 accounts, a sample of 600 were selected to test the accuracy and 45 mistakes were found. Estimate the 95% confidence limits for the number of mistakes in the population.

     b) Define the following :

         i) Null and alternative hypotheses

         ii) Type I and Type II errors

         iii) Critical region.

     c) A manager wants to find the expected time to finish a job, whose standard deviation is 5 days. What sample size should he choose to estimate mean time with 99% confidence with a permissible error of 2 days ?   5 + 5 + 5

11. a) A random sample of 16 students of one college scored on an average 85 marks with a standard deviation of 5. 20 students of the same subject of a different college scored 30 average marks with a standard deviation of 8. Can it be considered that the students of the college are equally competent ?

     b) To determine the viewing pattern of a particular TV programme, a market research company conducted a survey among different viewers. The following results were obtained :

Occupation	No. of viewers who liked it
Businessman	30
Professional	22
Salaried	35
Student	38
Retired	25

Can it be concluded from the data that opinion depends on profession ?

[$\chi^2_{0.05,\,4}$ = 9·49]

c) The score of two renowned cricketers in 10 innings, not necessarily following normal distribution is given below :

Tendulkar :	85	2	105	52	150	0	187	95	102	20
Lara	215	0	85	132	55	90	4	6	25	100

Are their mean scores equal ? [U (10, 10) at 5% = 23]   5 + 4 + 6

12. a) An advertising agency tried to determine the impact of a certain advertisement among different groups of students. They carried out a survey and the following figures were obtained :

Age group	High School (15 - 18 yrs.)	Under-graduate (19 - 22 yrs.)	Post-graduate (23 - 25 yrs.)
Liked	50	10	20
Did not like	42	12	26

Can it be concluded that opinion is related to age group ? $\left(\chi^2_{0.05, 2} = 5 \cdot 99\right)$

b) The following are the sales figures (in thousands each month) of three different insurance companies. Assuming sales figures follow normal distribution, test whether the mean sales are the same for the three companies :

Co. A-65, 68, 64, 70, 71, 75

Co. B-73, 68, 73, 69, 64

Co. C-64, 64, 66, 69

[F at 5% for 2, 12 d.f. = 6·93]   7 + 8

13. a) A salesman is expected to affect an average sale of Rs. 3,500. A sample test revealed that a particular salesman had made the following sales :

3,700, 3,400, 2,500, 5,200, 3,000 & 2,000.

Using 5% level of significance conclude whether his work is below standard or not (Given the value of t at 5%, 5 degrees of freedom is 2·015).

b) The following data shows the I.Q. of 5 workers before & after training.

I.Q. before training	110	120	123	132	125
I.Q. after training	120	118	125	136	121

Test whether there is any change in I.Q. after training.

(Given that $t_{0.01} = 4 \cdot 6$ for 4 d.f.)

c) Two types of batteries are tested for their lengths of life & the following data are obtained :

	No. of samples	Mean life	Variance
Type M	9	600 hrs.	121 hrs.
Type N	8	640 hrs.	144 hrs.

Is there any significant difference in the two means ? Value of t for 15 d.f. at 5% level is $2 \cdot 131$.   5 + 5 + 5

14. a) In a random sample of 600 & 1000 men from two cities 400 & 600 men are found to be literate. Do the data indicate at 5% level of significance that the populations are significantly different in the percentage of literacy ?

b) A fertilizer mixing machine is set to give 12 kg of nitrate for every quantity bag of fertilizer. Ten 100 kg bags are examined. The percentages of nitrate are as follows :

11, 14, 13, 12, 13, 12, 13, 14, 11 and 12.

Is there reason to believe that the machine is defective ? (Value of t for 9 d.f. is $2 \cdot 262$).

c) The mean time required to complete a certain job so that he may be 95% confident that the mean may remain within 2 days of the true mean. Population S.D is 8. How large was the sample?   5 + 5 + 5

END