Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MBA/SEM-2 (FT & PT)/MB-203/2013

2013
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 any *ten* of the following : $10 \times 1 = 10$

   i) A random variable X follows normal distribution. The mean of the random variable is 510 and standard deviation is 10. The value of Z when the value of the random variable is 600 is
   a) 12 b) 10
   c) 9 d) 6.

   ii) If *ln* (X) is a normally distributed random variable, then the variable X is said to be a
   a) Binomial variable b) Log normal variable
   c) Discriminate variable d) None of these.

   iii) When the number of degrees of freedom increases, the *t*-distribution approaches the
   a) Binomial distribution
   b) Normal distribution
   c) Poisson distribution
   d) Hypergeometric distribution.

iv) The mean and variance of a random sample of 64 observations has mean and variance as 160 and 100 respectively. Then 95% confidence limits of population mean are

a) (157·55, 162·45) b) (155·57, 145·62)

c) (135·5, 184·5) d) (157·95, 162·05).

v) Chi-square distribution is mainly used in

a) Test for goodness of fit

b) Test for independence of attributes

c) Test for specified Sd

d) all of these.

vi) A company representative is conducting a survey. He visits a locality and selects every third house for the survey. What is the type of sampling used by the representative to select the respondents ?

a) Judgment sampling b) Systematic sampling

c) Stratified sampling d) Cluster sampling

vii) A major automobile manufacturer had to recall several models due to quality control problems that were not discovered with its random final inspection procedures. This is an example of

a) Type I error

b) Type II error

c) Both types of error

d) Neither type of error.

viii) Consider the proposition that the mean of the sampling distribution of the sample mean (sample size n) is equal to the population mean. Which of the following is correct ?

a) The proposition is true only if the population's distribution is normal

b) The proposition is true only if n is large

c) The proposition is always (exactly) true

d) The proposition is true only if the n observations are uncorrelated (e.g., when the sampling is conducted with replacement).

ix) Which of the following is appropriate for estimation when the sample size is 30 or less, the population standard deviation is not known and the population data is normally distributed ?

a) Binomial distribution

b) F-distribution

c) Normal distribution

d) t-distribution.

x) In the Kruskal-Wallis test of k samples, the appropriate number of degrees of freedam is

a) k b) $k - 1$

c) $n_k - 1$ d) $n - k$.

xi) For samples of size greater than 30, the sampling distribution of the rank correlation coefficient is approximately which distribution ?

a) t b) Binomial

c) Chi-square d) Normal.

xii) Kolmogorov-Smirnov Test is used for

a) Goodness of fit of a distribution

b) Comparing two populations

c) Both of (a) and (b)

d) None of these.

GROUP – B

(Short Answer Type Questions)

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

2. In turning out certain toys in a manufacturing process in a factory, the average number of defectives is 10%. What is the probability of getting exactly 3 defectives in a sample of 10 toys chosen at random, by using the Poisson approximation to the binomial distribution ? (Given $e = 2.72$)

3. At a petrol station, the mean quantity of petrol sold to a vehicle is 20 litres per day with a standard deviation of 10 litres. If on a particular day, 100 vehicles took 25 or more litres of petrol, estimate the total number of vehicles who took petrol from the station on that day. Assume that the quantity of petrol taken from the station by a vehicle is a normal variate. (Given that area under the standard normal curve between Z = 0 and Z = 0·5 is 0·1915)

4. To determine the viewing pattern of 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 ?

[χ^2 (0.05, 4) = 9.49]

5. A shoe manufacturing company is producing 5000 pairs of shoes daily. From a sample of 500 pairs 2% are found to be defective. Estimate 95% confidence interval for the number of pairs of shoes that are reasonably expected to be defective in the daily production. Given that, $P(0< z <1.96) = 0.475$.

6. Write a short note on Factor Analysis.

GROUP – C

(Long Answer Type Questions)

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

7. a) Three marbles are drawn without replacement from a box containing 4 red and 5 white marbles. If x is the random variable which denotes the total number of white marbles drawn then find the probability distribution of x. Also find its variance. 4 + 4

   b) Bob supervises the packaging of college textbooks for a publisher. Bob knows that the number of cardboard boxes he will need depends partly on the size of the books. All books use the same size paper but may have differing numbers of pages. After studying shipment records for the last five years, Bob derived the following set of probabilities :

Number of pages	100	300	500	700	900	1100
Probability	0·05	0·10	0·25	0·25	0·20	0·15

   i) If Bob bases his box purchase on an expected length of 600 pages, will he have enough boxes ?

ii) If all 700-page books are edited down to 500 pages, what expected number of pages should he use ? 7

8. a) A manufature'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

b) The linear measurement of a product is normally distributed with a mean of 20 cm. and S.D of 4 cm. Items which measure between 18 cm and 23 cm are sold at 50P each and other items at 30P each. Find the total amount collected if altogether 10000 items are sold. How many items are of measurement 26 cm or more ?

[Given $p\ (0 \leq Z \leq 0.5) = 0.1915$; $p\ (0 \leq Z \leq 0.75) = 0.2734$ and $p\ (0 \leq Z \leq 1.5) = 0.4332$] 9

9. a) It is thought that the deepest part of sleep, which is also thought to be the time during which dreams most frequenly occur, is characterized by rapid eye movement (REM) of the sleeper. The successive lengths of seven REM intervals of a sleep volunteer were determined at a sleep clinic. The following times in minutes resulted : 37, 42, 51, 39, 44, 48, 29.

Give a 99% confidence interval estimate for the mean length of a REM interval of the volunteer. 7

b) In order to make a survey of the buying habits, two markets A and B are considered for two different parts of a city.

400 women shoppers are chosen at random in market A. Their average weekly expenditure on food is found to be Rs. 250 with an s.d. of Rs. 40. These figures are Rs. 220 and Rs. 55 respectively in the market B where also 400 women shoppers are chosen at random. Test at 1% level of significance whether the average weekly food expenditure of the two populations of shoppers are equal. (At 1% level of significance the z value is 2.58)

8

10. a) What is ANOVA ? 5

b) A random sample of five motor car tyres is taken from each of 3 brands manufactured by three companies. The lifetime of these tyres (as measured by the mileage run) is shown below on the basis of the data. Test whether the average lifetimes of the 3 brands of tyres are equal or not.

Brand

A	B	C
35	32	34
34	32	33
34	31	32
33	28	32
34	29	33

10

11. a) The owner of a manufacturing company has been concerned about the increase of manufacturing cost over the last decade. The following data provide a time series of cost per unit for the company's leading product over the past 10 years.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Cost/ unit	332	317	357	392	402	405	410	427	405	438

Calculate a 5 year moving average for the unit cost of production. Also fit a linear trend line by the method of least squares. What is the expected per unit cost for 2012 ? 4 + 4 + 1

b) For a given set of 10 observations find the Pearson's Rank Correlation Coefficient. 6

X	5	4	3	8	10	6	6	7	8	5
Y	6	2	1	5	6	3	9	8	10	7