



Name :

Roll No. :

Invigilator's Signature :

CS/MBA (OLD)/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) The median of the following observations arranged in ascending order is 24. What is the value of x ?

11, 12, 14, 18, $x + 2$, $x + 4$, 30, 32, 35, 41

- | | |
|-------|--------|
| a) 16 | b) 17 |
| c) 20 | d) 21. |

ii) What is the variance of the following data ?

X : 10 14 36 25 15

- | | |
|---------|---------|
| a) 88.4 | b) 9.40 |
| c) 28.4 | d) 75. |



- viii) Which of the following could never be described by a binomial distribution ?
- The number of defective widgets produced by an assembly process
 - The amount of water used daily by a single household
 - The number of students in a class who can answer a question correctly
 - All of these can always be described by a binomial distribution.
- ix) If $E (X) = 2$, then $E (2X + 3) =$
- 5
 - 2
 - 7
 - 0.
- x) A good estimator should be
- unbiased
 - consistent
 - efficient
 - all of these.
- xi) The variance of Poisson distribution with parameter λ is
- λ
 - λ^2
 - λ^3
 - $\frac{\lambda}{2}$.
- xii) 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 ?
- The proposition is true only if the population distribution is normal
 - The proposition is true only if n is large
 - The proposition is always (exactly) true
 - The proposition is true only if the n observations are uncorrelated (e.g., when the sampling is conducted with replacement).



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. Draw a pie-chart to represent the following data in relation to cost of manufacture :

| Item | Cost (in Rs.) |
|-------------------|------------------------|
| Cost of materials | 38,400 |
| Cost of labour | 30,720 |
| Direct expenses | 11,520 |
| Factory overhead | 15,360 |
| Total | 96,000 |

3. A quality control inspector tested nine samples of each of three designs A, B & C of a certain bearing for a new electrical machine. The following data are the number of hours it took for each bearing to fail when the machine was run continuously at maximum output, with a load on the machine equivalent to 1.9 times the intended capacity.

| | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|
| A | 16 | 16 | 53 | 15 | 31 | 17 | 14 | 30 | 20 |
| B | 18 | 27 | 23 | 21 | 22 | 26 | 39 | 17 | 28 |
| C | 31 | 16 | 42 | 20 | 18 | 17 | 16 | 15 | 19 |

Calculate the mean and median for each group and suggest which design is best and why.



4. Two variates have the least square regression lines, $x+4y+3=0$ and $4x+9y+5=0$. Find the mean values of x and y and the correlation coefficient between the two variates.
5. A manufacturer supplies dot pens in boxes of 50. He claims that 2% of the pens are defective. In any box what is the probability of finding
- i) exactly two defectives ?
 - ii) more than two defectives ?
6. What is meant by sampling ? Distinguish between statistic and parameter by giving example.
7. A bag contains defective articles the exact number of which is unknown. A sample of 100 from the bag gives 8 defective articles. Find the possible limits of the proportion of defective articles in that bag.



GROUP – C

(Long Answer Type Questions)

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

8. a) Following data relate to ranks given by 3 judges to 12 candidates :

| Candidates | A | B | C | D | E | F | G | H | I | J | K | L |
|------------|----|----|---|----|---|----|----|----|----|----|----|---|
| Judge 1 | 5 | 2 | 9 | 11 | 7 | 10 | 4 | 10 | 8 | 3 | 12 | 6 |
| Judge 2 | 7 | 11 | 8 | 10 | 6 | 2 | 4 | 9 | 12 | 13 | 11 | 5 |
| Judge 3 | 11 | 12 | 3 | 4 | 5 | 6 | 12 | 11 | 10 | 9 | 8 | 7 |

Find out, using Rank correlation coefficient, which pair of judges has most common approach in their thinking.

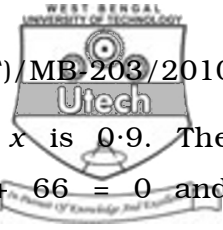
- b) $n_1 = 400, n_2 = 350, n_3 = 250$

If the average of $x_1 = 500$, that of $x_2 = 800$ & that of $x_3 = 1000$ and the standard deviations are 50, 100, 80 respectively, calculate the combined average and standard deviation for 3 groups taken together. $8 + 7$

9. a) Following probability distribution is given to you :

| | | | | | | |
|-----------|------|-----|------|------|------|------|
| X | 50 | 100 | 150 | 200 | 250 | 300 |
| $P (X)$ | 0.05 | k | $3k$ | $5k$ | $2k$ | 0.05 |

Determine the value of k and hence find $E (X)$. Find the standard deviation of X .



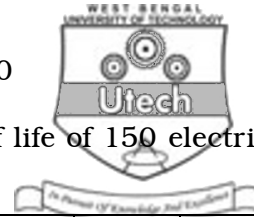
- b) You are given that the variance of x is 0.9. The regression equations are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. Find —
- the average values of x and y
 - correlation coefficient between two variables
 - S.D. of y . 7 + 8

10. a) An automatic machine was designed to pack exactly 2 kg of Vanaspati. A sample of 100 tins was examined to test the machine. The average weight was found to be 1.94 kg with standard deviation of 0.1 kg. Is the machine working properly ? At 5% level of significance $z = 1.64$ for one tailed test and $z = 1.96$ for two tailed test.
- b) A machine produced 20 defective items in a batch of 450. After overhauling it produced 10 defective items in a batch of 300. Has the machine overhauled ? At 5% level of significance $z = 1.64$ for one tailed test and $z = 1.96$ for two tailed test. 8 + 7

11. a) Prices of a particular commodity in five years in two different cities are given below :

| Price in City A | Price in City B |
|-----------------|-----------------|
| 20 | 100 |
| 22 | 200 |
| 19 | 180 |
| 23 | 120 |
| 26 | 150 |

Which city had more stable price ?



b) The following table gives the length of life of 150 electric lamps.

| | | | | | | | | |
|---------------|-------|---------|----------|-----------|-----------|-----------|-----------|-----------|
| Life (hour) | 0-400 | 400-800 | 800-1200 | 1200-1600 | 1600-2000 | 2000-2400 | 2400-2800 | 2800-3200 |
| Frequency | 14 | 12 | 40 | 41 | 27 | 13 | 19 | 4 |

Calculate the modal value of the distribution.

c) Find the median of the following data set :

| | | | | | | | |
|--------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Income (in Rs.) | Below 100 | 100 – 120 | 120 – 140 | 140 – 160 | 160 – 180 | 180 – 200 | Above 200 |
| Frequency | 15 | 12 | 30 | 20 | 16 | 10 | 17 |

5 + 5 + 5

12. The administrator of a hospital has ordered a study of the amount of time a patient must wait before being treated by emergency room personnel. The following data were collected during a typical day :

Waiting Time (Minutes)

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|
| 12 | 16 | 21 | 20 | 24 | 13 | 11 | 17 | 29 | 18 |
| 26 | 14 | 7 | 14 | 25 | 10 | 27 | 15 | 16 | 5 |

- a) Arrange the data in an array from lowest to highest. What comment can you make about patient waiting time from your data array ?
- b) Construct a frequency distribution using six classes. What additional interpretation can you give to the data from the frequency distribution ?
- c) From an ogive, state how long 75% of the patients should expect to wait based on these data. 3 + 5 + 7