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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 : $10 \times 1 = 10$

   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.

iii) A distribution has mean = 110; median = 115.

Which of the following is the value of mode ?

a) 110 b) 115

c) 125 d) 120.

iv) If $b_{yx} = -0{\cdot}8$, $r = -0{\cdot}96$, S.D. of $y = 12$, what is the S.D. of x ?

a) 12 b) 20

c) 10 d) 8.

v) The values of two regression coefficients are 1·2 and 0·9. What is the value of correlation coefficient ?

a) Equal to one b) Greater than one

c) Less than one d) None of these.

vi) In case of symmetrical distribution

a) Mean = Median = Mode

b) Mean > Median > Mode

c) Mean < Median < Mode

d) Mean + Mode = Median.

vii) For the variables x and y, the regression lines are $4x - 5y + 33 = 0$ and $20x - 9y - 107 = 0$. Then the value of b_{yx} (regression coefficient of y on x) is

a) $\frac{4}{5}$ b) $\frac{9}{20}$

c) $\frac{9}{25}$ d) $\frac{20}{9}$.

viii) Which of the following could never be described by a binomial distribution ?

a) The number of defective widgets produced by an assembly process

b) The amount of water used daily by a single household

c) The number of students in a class who can answer a question correctly

d) All of these can always be described by a binomial distribution.

ix) If $E(X) = 2$, then $E(2X + 3) =$

a) 5 b) 2

c) 7 d) 0.

x) A good estimator should be

a) unbiased b) consistent

c) efficient d) all of these.

xi) The variance of Poisson distribution with parameter λ is

a) λ b) λ^2

c) λ^3 d) $\frac{\lambda}{2}$.

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 ?

a) The proposition is true only if the population 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).

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 × 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 —

i) the average values of x and y

ii) correlation coefficient between two variables

iii) 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