De Mazenod College Kandana

Business Statistics

2·04·2018

2nd Term Test (2018 April) Paper - I Grade 13

Time 2hours

Answer all questions.

Select the most appropriate answer.

1. Which of the following statements is true?
   (1) Only quantitative data are studied in Statistics.
   (2) Statistical studies are more appropriate when there is no variation.
   (3) In Statistics always make decisions about entire population by studying samples.
   (4) Ranking the likeness towards a product is an example for a categorical variable.
   (5) Salary register of a company is an example for primary data.

2. Which of the above statement/statements is/are true?
   A: Sample size of the survey can be decided according to results of the pilot survey.
   B: Completeness of a questionnaire is tested by editing.
   C: Electronic equipments can be used for direct observation method.
   (1) A only
   (2) B only
   (3) C only
   (4) A and B only
   (5) A and C only

3. Which of the following statements is false?
   (1) Success of the self enumeration method depends on the education level of the researchers.
   (2) Personal interview method is not appropriate when the population is geographically expanded.
   (3) In telephone conversation method, the accuracy of data cannot be confirmed.
   (4) Number of questions in a questionnaire depends on the purpose of survey
   (5) When financially burden, self enumeration method is more appropriate to collect data

4. When the total consists with components the most appropriate method to present the variation in relative importance of components is,
   (1) Pie chart
   (2) Simple bar chart
   (3) Component bar chart
   (4) Multiple bar chart
   (5) Percentage component bar chart

5. Which of the following statement/statements true?
   A: In a positively skewed distribution, $Q_3 - Q_1 > 2Q_2$
   B: In a Meso kurtic distribution $P_{90} - P_{10} = 2(Q_3 - Q_1)$
   C: In a Symmetrical distribution $Q_3 + Q_1 = 2Q_2$
   (1) A only
   (2) B only
   (3) C only
   (4) A and C
   (5) All A, B and C

6. Following are the marks obtained by a group of students in an assessment

Marks	0-5	5-10	10-15	15-20	20-25
No of students	3	5	8	6	3

Median value of above marks is

(1) 12.5
(2) 12.81
(3) 13.31
(4) 13.13
(5) 13.63

7. Within 8 hours of work shift a company producers 90 units in product A and 60 units in product B . Mean no of units produced by this company within 8 hours of work shift is,

(1) 18.75
(2) 66
(3) 72
(4) 75
(5) 81.8

8. Which of the following statement/s is/are true about weighted mean?

(1) A only
(2) B only
(3) C only
(4) A and B only
(5) All A, B and C

9. Mean marks of 100 students in a class is 51.6 and mean marks of 60 girls is 54. Mean marks of boys is,

(1) 45
(2) 48
(3) 50
(4) 50.4
(5) 52.8

10. Mean value of a moderately skewed distribution is 52. Mode is 40. Median value of the distribution is,

(1) 44
(2) 45
(3) 46
(4) 48
(5) 50

11. Total value of a data set with 20 units is 480. Summation of square values is 12500. Coefficient of variation in this data set is,

(1) 3.43
(2) 20.83
(3) 29.17
(4) 34.3
(5) 38.4

12. Coefficient of kurtosis of a distribution is 0.25 first quartile is 42 and median is 56.Quartile deviation of this distribution is,

(1) 14
(2) 20
(3) 24
(4) 28
(5) 49

13. Which of the following statements is true?

(1) When the product movement coefficient of correlation coefficient is zero, there is no correlation between two variables.
(2) When the value of coefficient of determination is 0.64, the coefficient of correlation is 0.8
(3) If coefficient of regression of X on Y is greater than one, the value of coefficient of regression of Y on X should be less than one
(4) The range of coefficient of determinant lies in between -1and +1.
(5) Coefficient of regression presents the change in independent variable according to units change in dependent variable.

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14. Regression line between x and y received as y=25-0.1x Which of the following statement/statements is/are true?

A: There is a weak correlation between two variables
B: When X changes by one unit the value of Y will decrease by 0.1
C: In point (0,25) regression line cuts horizontal axis.

1. A only
2. B only
3. C only
4. A and C only
5. B and C only

15. Out of total variations in dependent variable 20% expressed by the errors. Total squared values of errors is 800. Summation of the squared values of deviations presented by the regression line is,

1. 40
2. 1600
3. 2400
4. 3200
5. 4000

16. Which of the following statement/s is /are false about probability approaches.

A: Classical approach calculating probability by conducting a random experiment which create equally likely results.
B: In relative frequency approach, the experiment should be done repeatedly with equal conditions.
C: Only the probability values received in subjective approach are subjective.

1. A only
2. B only
3. C only
4. A and C only
5. All A, B and C

17. If A and B are two events such that P(A)=1/3, P(B/A)=1/2and P(A∪B)=3/4 , the A and B events are,

1. Mutually exclusive events
2. Independent events
3. Dependent events
4. Collectively exhaustive events
5. Equally likely events

18. A and B are equally likely and independent two events. Probability of happening both events together is 0.16. Probability of happening event A is,

1. 0.2
2. 0.4
3. 0.16
4. 0.64
5. 0.8

19. A product consists with A,B,C components. Probability that A component being defective is 10%. Probability that B component being defective is 20%. Probability that C component being defective is 30%. What is the probability that product being defective?

1. 0.006
2. 0.4
3. 0.06
4. 0.504
5. 0.496

20. X discrete random variable can be obtained only 0,1,2,3,and 4 values. Which of the following functions can be considered as probability functions.

1. $f(x)=\frac{x-1}{2}$
2. $f(x)=\frac{x-3}{12}$
3. $f(x)=\frac{x+1}{15}$
4. $f(x)=\frac{x+3}{16}$
5. $f(x)=\frac{x^2}{20}$

21. Which of the following statements is true?
    1. If X is a discrete random variable and X: 0,1,2,.....,n the value of $\sum_{i=1}^{k} f(x) + \sum_{i=k}^{n} f(x) = 1$
    2. If x is a random variable and a and b are constants, E(ax±b) = a.E(x) + b
    3. If x and y are random variables, the value of Var(x± y)=Var(x)± Var (y)
    4. If x is a continuous random variable, to become f(x) a probability function, $\int_{-\infty}^{+\infty} f(x)dx=1$
    5. Expected value of x random variable cannot be a negative value.

22. In a binomial distribution with 6 number of trials, when P(x=4) = P(x=2), The probability of getting success is,
    1. 1/4
    2. 3/4
    3. 1/3
    4. 2/3
    5. 1/9

23. Mean value of a Poisson distribution when P(x=2) = P(x=4) is,
    1. $\sqrt{2}$
    2. 2
    3. 4
    4. $\sqrt{6}$
    5. 6

24. In an examination standard mark of a student who obtained 40 marks was -0.6 and standard mark of a student who obtained 80 marks was 1.4, Mean and standard deviation of the marks in this examination are,
    1. 52,20
    2. 70,50
    3. 50,20
    4. 52,50
    5. 50,40

25. Mean life time of a bulk of electric bulbs is 4000 hours and standard deviation is 400 hours. After how many hours the 90% of bulbs will burn?
    1. 3344
    2. 3488
    3. 4512
    4. 4656
    5. 4784

26. Which of the following statements is false?
    1. In Quota sampling population is categorized as able to obtain required sample.
    2. No need a sampling frame for Quota Sampling.
    3. Sampling frame is not essential in Judgment sampling.
    4. Systematic sampling is a semi random sampling method
    5. Cluster sampling is appropriate when intra cluster correlation coefficient is a less value.

27. Which of the following statements is/are true?

    A: Central limit theorem is used when population variance is unknown

    B: Central limit theorem states that when increasing sample size, the sampling distribution of sample mean approximately normally distributed

    C: Always sampling distribution of sample mean is equal to population mean.
    1. A only
    2. B only
    3. C only
    4. A and B only
    5. A and C only

28. When data on daily sales of a company are available, the most appropriate method of selecting a sample in order to estimate about daily sales of the company is?
    1. Convenience sampling
    2. Judgment sampling
    3. Quota sampling
    4. Systematic sampling
    5. Simple random sampling

29. When selecting a simple random sample of size 2 from population {2, 4, 6} without replacement, variance of the sampling distribution of sample mean is,

1. 8
2. 3
3. 8/3
4. 4/3
5. 2/3

30. When selecting a random sample with size 36 from a population with B(9,0.5) , the probability that sample mean not exceed five is,

1. 0.0282
2. 0.4772
3. 0.0668
4. 0.4332
5. 0.9772

31. Mean and variance of a sample of size 25 which drawn randomly from a normal population were 52 and 16 respectively. Upper confidence limit of the confidence interval which was constructed for population mean under 95% confidence level is,

1. 53.0496
2. 53.2544
3. 53.3184
4. 53.368
5. 53.648

32. Which of the following statements is true?

1. When increasing sample size of a biased estimator, if variance approaches zero then it is called a consistent estimator.
2. When the value of an estimator equals to population parameter then it is called an unbiased estimator.
3. The estimator which is having low variance is an efficient estimator.
4. Sample standard deviation $S = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$ is an unbiased estimator for population standard deviation σ.
5. In a normal population sample mean as well as sample median is also a quantitative estimator for population mean.

33. In a random sample of 100 units which was selected randomly from product A 10 units are defective and in a random sample of 100 units which was selected from product B 20 units are defective. Standard error of the sampling distribution of the difference between two population proportions is,

1. 0.0025
2. 0.05
3. 0.15
4. -0.05
5. -0.0025

34. Which of the following statement/s is/are true about hypothesis testing?

A: Acceptance of alternative hypothesis when it is false is called type two error.
B: Interval estimation can be used for hypothesis testing only in two tail tests.
C: The test with 5% significant level is more appropriate than a test with 10% significant level.

1. A only
2. B only
3. C only
4. B and C only
5. All A,B,and C

35. Probability of rejecting null hypothesis when significant level is α and power of the test is 1-β is,

1. α
2. β
3. 1-α
4. α+β
5. 1+α-β

36. $\bar{X}>53.2$ considers as critical region when testing the hypothesis H_1: μ=55 against hypothesis Ho: μ=50 by selecting a sample of size 25 from a population with variance 36. Power of the test in this test is,

1. 0.0668
2. 0.4332
3. 0.4962
4. 0.9332
5. 0.9962

37. A company states that at least 50% of the people in a certain area like soap A. In order to test this a sample of 100 was selected randomly and only 40 people like soap A. P value of this test under 5% significant level is,

1. 0.0228
2. 0.0456
3. 0.05
4. 0.4772
5. 0.95

38. Following results were obtained by rolling a fair dice 60 times in order to test whether it is a fair one.

Number:	1	2	3	4	5	6
No. of times:	12	8	14	7	9	10

The value of test statistic is,

1. 34
2. 12
3. 6
4. 3.4
5. 1.2

39. Which of the following statement/s is/are true about analysis of variance?

A: Analysis of variance is used to check whether means of two or more populations are equal.
B: Analysis of variance is used to check whether variances of two or more populations are equal.
C: Test statistic is calculated by dividing variance among samples by variance within samples.

1. A only
2. B only
3. C only
4. A and C only
5. All A, B and C

40. Equation of the trend line of a company which was constructed for annual production by considering year 2010 as origin is Y=540+57.6X Units of X are years. Monthly increment is,

1. 0.4
2. 0.48
3. 4
4. 4.8
5. 57.6

41. A factor which cause for seasonal variations is,

1. Changes in personal habits
2. Civil war
3. Weather changes
4. An economic crisis
5. A school vacation

42. First central moving average value of time series 54, 66 48, 52, 64, 72..... With order four is,

1. 28.125
2. 55
3. 56.25
4. 57.5
5. 59

43. Production of a company within a quarter with seasonal index 105 is 60000 units. Possible production units for a quarter with seasonal index 70 is,

1. 40000
2. 45000
3. 72000
4. 84000
5. 90000

44. With compared to year 2010 total income of a company increased by 50% in year 2015. If the price of the good increased by 25% during this period, increment in production quantity is,

1. 10%
2. 20%
3. 25%
4. 33.33%
5. 40%

45. Both time reversal test and factor reversal test are satisfied by,

A: Simple value relative

B: Laspeyre's index

C: Fisher's index

1. A only
2. B only
3. C only
4. A and C only
5. B and C only

46. Group indices of all three groups X,Y,Z are 120,150,and 180 respectively. Ratio of expenditure is 2:3:5. Overall index is,

1. 150
2. 156
3. 159
4. 160
5. 172

47. With compared to year 2010 consumer price index in year 2018 was 160. How much of extra income need to be obtained by a person who obtained Rs.20000 of salary in year 2010 in order to maintain same standard of living.

1. Rs.10000
2. Rs.12000
3. Rs.25000
4. Rs.30000
5. Rs.32000

48. Purpose of statistical quality control is,

1. Removing defective items in production
2. Allowing random variations
3. Replacing defective items by non defective items in finished goods.
4. Assuring maximum quality by testing all the units.
5. Controlling reasonable factors which cause for assignable causes.

49. Which of the following/s is/are considered when calculating control limits for C chart?

1. Binomial distribution
2. Poisson distribution
3. Normal Distribution
4. Binomial and Poisson distributions
5. Poisson and Normal distribution

50. Which of following statement/s is/are true about OC curve?

A: OC curve helps to separate good lot and bad lot.

B: When sample size decreases the slope of the OC curve will increase.

C: OC curve can be obtained when probability of acceptance graph against defective units.

1. A only
2. B only
3. C only
4. A and C only
5. B and C only

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Grade 13

2nd Term

(2018 April) 3hours

Answer five questions selecting at least two questions from each part.

Part I

1. (a) What are the factors to be considered when constructing a questionnaire? (03 marks)

(b) How stem and leaf diagram and box and whisker diagram help in making decisions about set of data. (04 marks)

(c) Following information obtained by dividing number of people in city A and B in to equal categories according to income level.

Income (Rs. Million)	
City A	City B
40	80
60	120
80	160
120	200
200	240

i. Present above data by a Lorenze curve in a same Cartesian plane.

ii. What is the percentage of people who receive more than 50% of income in each city ? (07 marks)

(d) Following table provides information about daily salary of employees who work on contract basis.

Salary	Below Rs.200	Rs.200-400	Rs.400-600	Rs.600-800	Rs.800-1000	Rs.1000-1200
No. of employees	5	17	28	36	24	10

i. Draw a less than ogive by using above data.

ii. Using the ogive,

(a) What is the maximum salary of 25% employees who receive minimum salary.

(b) How many employees are there who receive Salary in between Rs.500 and Rs.900 (06 marks)

2. (a) Examine the statement " Dispersion confirms the reliability of central tendency. (03 marks)

(b) Define weighted mean, geometric mean and harmonic mean. State one example for practical use of each mean.

(06 marks)

(c) Weights of 50 students in a class are given in the following table.

51	68	55	43	61	53	64	45	62	58
63	52	56	74	46	67	62	50	59	65
56	70	42	60	54	57	62	55	61	57
48	64	53	73	57	68	44	52	66	63
69	56	47	59	62	54	61	74	48	58

i. Construct a frequency distribution by dividing above data into class intervals 40-44, 45-49, ...

ii. Draw a histogram and construct frequency polygon on it.

iii. Calculate the mode, median, mean and standard deviation.

iv. Calculate a suitable measure to measure skewness and state your idea about the nature of the distribution.

(08 marks)

(d) What is the function of skewness and kurtosis when deciding the nature of a distribution? (03 marks)

03. (a) What is the logical basis of an index number?

How index numbers become important with regard to economy of a country? (04 marks)

(b) Following data provides price indices and percentage of expenses of few groups with regard to cost of living for year 2015 and 2016.

Group	Food	Housing	Clothing	Transportation	Health	Other
Percentage of expenses	45%	20%	15%	10%	5%	5%

i. Construct cost of living indices for year 2015 and 2016 separately.

ii. What is the percentage change in cost of living in year 2016 with compared to year 2015. (06 marks)

(c) What is the meaning of deseasonalization of a time series? State the importance of deseasonalization.

(04 marks)

(d) Following table provides production units of a company in past few years (in rupees thousands)

Year:	2012	2013	2014	2015	2016	2017
Production:	65	80	95	85	110	105

i. Estimate the trend line for annual production by applying least squares method.

ii. Construct trend line for quarterly production by considering first quarter of year 2015 as origin.

(06 marks)

04. (a) Explain the difference between product movement coefficient of correlation and rank coefficient of correlation. (04 marks)

(b) Following table provides information on monthly income and expenses spent for clothing of 10 families.

Annual income (X) (Rs.100000)	5	7	9	14	12	10	8	6	16	3
Expenses for clothing (y)(Rs.10000)	3	4	7	9	12	6	3	3	11	2

$\Sigma X=90$, $\Sigma Y=60$, $\Sigma X^2=960$, $\Sigma Y^2=478$, $\Sigma XY=660$

i. Obtain least squares regression line of X on Y

ii. Estimate expenses spend for clothing by a family who earn annual income of Rs. 800000.

iii. Calculate the coefficient of correlation in between X and Y and interpret it. (06 marks)

(c) State the function and limits of statistical quality control. (04 marks)

(d) An acceptance sampling plan prepared by randomly selecting 50 units at a time, as it reject the lot if there are at least two defective units. Calculate the probability of accepting the lot when the defective percentages of production are 1%, 2%, 3%, 4%, 6%, 8%, and 10% respectively and draw the OC curve. State your ideas on this acceptance sampling plan. (06 marks)

Part 2

05. (a) Why probability concept become important in business field? (03 marks)

(b) A committee of three persons should be selected out of 8 males and 4 females. What is the probability of selecting at least two males for the committee? (05 marks)

(c) Employees of a company categorized according to their gender, salary and educational qualifications as follows.

	Less than Rs.50000		Rs. 50000 - Rs. 100000		Above Rs. 100000	
	No Degree	Degree holders	No Degree	Degree holders	No Degree	Degree holders
Female	20	10	15	25	10	30
Male	30	20	35	15	25	35

If randomly selects an employee, Calculate

I. Probability that person being a female

II. Probability that person being a degree holder

III. Probability that person being a female with no degree

IV. If that person earns more than 100000 salary find the probability of being a degree holder.

V. If that person is a male find the probability of not being a degree holder.

VI. Probability that person is a female with a degree and obtain more than Rs.100000 salary. (08 marks)

(d) If A and B are two events such that P(A)=2/3, P(B)=1/2 and P(A/B)=3/4 find the value of P(B/A)? (04 marks)

06. (a) Define binomial distribution.

Mention the parameters of binomial distribution and state an example for a situation where binomial distribution can be used practically? (03 marks)

(b) A certain cricket team is participating for a cricket tournament of five matches with another team. Possibility of winning that team is in ratio of 2:1. Calculate

I. Probability that this team is winning all the matches

II. Probability of winning at least one match by this team.

III. Probability of winning the tournament by this team. (06 marks)

(c) Explain under which conditions poisson distribution can be approximated by a normal distriobution

There are 25% defective units in a product. Find the probability that there are more than 10 defective units in a bulk of 48 units. (05 marks)

(d) 12% of students who participated for an examination obtained more than 75 marks. And 8% of students obtained less than 25 marks. If fail mark of this examination is 40, what is the percentage of failed students?(06 marks)

7. (a) Compare simple random sampling and systematic sampling.

Explain the method of drawing a simple random sample and a systematic sample of 25 units from 1000 units. (05 marks)

(b) Samples of size 2 are drawn from a population of $\{2,4,6\}$ in the situations of with replacement and without replacement. Find the variances of sampling distribution of sample mean. Explain which sampling method is more realistic? (06 marks)

(c) Explain the sampling distribution. If a sample of size n is drawn from a population of size N with mean μ, variance σ^2 and sample proportion π, calculate the mean and variance of sampling distribution of sample mean and sampling distribution of sample proportion. (04 marks)

(d) State the Central limit theorem.

If a random sample of size 72 is drawn from a poisson distribution with mean 8, find the probability that the sample mean will exceed 7.5. (05 marks)

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8. (a) Explain the unbiasedness and efficiency of an estimator.

Show that sample mean ($\bar{X}$) is an unbiased and consistent estimator for mean μ. (05 marks)

(b) Following information obtained by measuring the weight of a sample of 25 small washing powder packets which were packed automatically by a machine.

$\Sigma X=750$ $\Sigma X^2=23364$

Calculate unbiased estimators for mean weight and variance weight of washing powder packets which were packed by this machine.

Construct 95% confidence interval. (05 marks)

(c) In a random sample of 100 females 40 females like a certain type soap and in a random sample of 100 males 30 males like that soap. Check whether females like this soap than males under 0.05 level. (05 marks)

(d) Following results were received by a survey conducted on likeness towards a certain television program.

	Children	Youth	Elder
Like	60	40	20
Dislike	40	20	20

Check whether the likeness towards this program depends on age under α = 0.05 level (05 marks)