

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2021

BST1C05 – Descriptive Statistics

(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

SECTION-A**Each question carries 2 Marks.****Maximum Marks that can be scored in this section is 20.**

- 1 Differentiate between diagrams and graphs.
- 2 Define median.
- 3 What are the uses of frequency curve?
- 4 Define standard deviation.
- 5 Find the quartile deviation: 12,14,14,16,13,18,18.
- 6 What is meant by skewness?
- 7 What is meant by exclusive classification?
- 8 Define class limits and class boundaries.
- 9 Give any two properties of arithmetic mean.
- 10 The coefficient of variation of a set of observations is 13%. The standard deviation is 3. Find the arithmetic mean.
- 11 Explain the concept of central tendency.
- 12 The arithmetic mean and standard deviation of a set of 12 observations were 14 and 16 respectively. If 5 is added to all the observations, what will be the the new mean and standard deviation?

SECTION-B**Each question carries 5 Marks.****Maximum Marks that can be scored in this section is 30.**

- 13 Explain the desirable properties of a good measure of dispersion.
- 14 Distinguish between qualitative and quantitative classifications.

15. For the following data, calculate mean deviation from median.

X	10	11	12	14	17	18
frequency	5	6	6	4	3	2

16. Define geometric mean and harmonic mean.
17. Compare the consistency of the following two sets of observations.
Set 1: 10,12,11,13,17,19,24,36,22
Set 2: 20,20,21,24,21,21,20,21,22
18. Explain the use of percentiles and deciles.
19. Compute the mode of the following data:

Class	10-14	14-18	18-22	22-26	26-30
frequency	20	30	11	3	5

SECTION-C

(Answer any one Question and carries 10 marks)

20. Explain the construction of histogram when
i) the classes are having the same width
ii) when they are of unequal width.
21. Explain kurtosis. Find the percentile measure of kurtosis from the data given below.

classes	50-60	60-70	70-80	80-90	90-100	100-120
frequency	30	34	40	32	18	6

(1 x 10 = 10 Marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Statistics Degree Examination, November 2021

BST1B01 – Official Statistics & Probability

(2019 Admission onwards)

Time: 2 ½ hours

Max. Marks : 80

Section-A

[Each question carries 2 marks]

1. Define sample space. Give an example of a random experiment in which the sample space is continuous.
2. First three raw moments of X are -1, 55, and -62.5. Obtain coefficient of skewness based on moments.
3. State multiplication theorem of probability.
4. $f(x) = kx$, $x = 1, 2, 3$. and zero else where is a p.m.f. Find $P(X \geq 2.5)$.
5. Define Dispersion.
6. If $r_{12} = 0.93$, $r_{13} = 0.99$ and $r_{23} = 0.92$. Calculate $r_{12,3}$.
7. State principle of least squares.
8. Define Harmonic mean.
9. What is scatter diagram?
10. What are the functions of NSSO?
11. Two regression coefficients cannot be greater than one simultaneously. Justify.
12. Define r^{th} central moments.
13. What is the sum of squares of 10 observations with mean 4 and variance 36.
14. If X_1 and X_2 are independent random variables, show that $V(X_1 + X_2) = V(X_1 - X_2)$.
15. Define the probability density function of a random variable. What are its properties?

(Maximum Mark=25)

Section-B

[Each question carries 5 marks]

16. If X is a random variable with the following p.m.f

X	-2	0	2
$f(x)$	1/4	1/2	1/4

Obtain β_1 and β_2 , the measure of skewness and kurtosis

17. Is pair wise independence implies mutual independence? Justify your claim.
 18. Examine whether the following is a distribution function

$$F(x) = \begin{cases} 0, & x < -2 \\ \frac{1}{2}\left(\frac{x}{2} + 1\right), & -2 \leq x \leq 2 \\ 1, & x > 2 \end{cases}$$

Also find its p.d.f.

19. Given the regression lines $9x - 4y + 15 = 0$ and $25x - 6y - 7 = 0$. Find the coefficient of correlation between X and Y .
 20. In a group of n the mean age of men and women is 30 years. If the mean age of x men is 32 and $(n - x)$ women is 27. Find the percentage of men in the group.
 21. State and prove addition theorem of probability.
 22. Derive an expression for the angle between two regression lines.
 23. Let $p(x) = \frac{x}{15}$, $x = 1, 2, 3, 4, 5$. Find (i) $P\{X = 1 \text{ or } 2\}$ and (ii) $P\{1/2 < x < 5/2 / x > 1\}$.

(Maximum Mark=35)

Section-C

[Each question carries 10 marks. Answer any two Questions]

24. Given the distribution function of X as

$$F(x) = \begin{cases} 0, & \text{for } x < 0 \\ kx^2, & \text{for } 0 \leq x < 3 \\ k(-x^2 + 12x - 18), & \text{for } 3 \leq x < 6 \\ 1, & \text{for } x \geq 6 \end{cases}$$

- (a) Obtain the pdf of X
 (b) Find k
 (c) Find $P(2 < X < 4)$
 (d) $P(X > 2 / X < 5)$
25. (a) Show that Karl Pearson's coefficient of correlation is independent of change of origin and scale.
 (b) State and establish any two properties of regression coefficients.
26. State and prove Baye's Theorem and explain its importance.
27. Find measures of skewness and kurtosis based on moments for the distribution

$$f(x) = \frac{1}{2}x^2e^{-x}, 0 < x < \infty.$$

(2x10=20 Marks)

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2021

BST1C01 – Introductory Statistics

(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

Part A

Each question carries 2 Marks.

Maximum Marks that can be scored in this Part is 20

1. Compare less than and greater than Ogives.
2. What do you mean by deciles?
3. Define harmonic mean.
4. What is the variance of the observations 7, 9, 11?
5. How will you find range of a grouped frequency distribution?
6. What is meant by relative measures of dispersion?
7. Define mean deviation.
8. Distinguish between discrete and continuous data. Give examples.
9. What is combined standard deviation?
10. Define Regression.
11. Write any two features of Indian statistical system.
12. The average weight of 40 males was found to be 80 and that of a group of 30 females were 50. Find the combined mean weight of the 70 persons.

Part B

Each question carries 5 Marks.

Maximum Marks that can be scored in this Part is 30

13. Explain Skewness. What are the different types of Skewness? Explain any one of them.
14. Discuss the graphical methods used for representing a frequency distribution
15. Explain the responsibilities of CSO.
16. Define row moment and central moment. State and prove the relation between them?

17. Explain the principle of least squares method of fitting of a second-degree curve of the form $y = a + bx + cx^2$ for n pairs of values.
18. Explain any two methods to estimate the secular trend with examples?
19. Distinguish between primary data and secondary data.

Part C

Answer any one question and carries 10 Marks.

20. (a) Define Kurtosis. What are the different types of Kurtosis?
 (b) Calculate coefficient of kurtosis β_2 for the following frequency Distribution

Class:	0-10	10-20	20-30	30-40	40-50	50-60
Frequency:	2	5	8	6	4	1
21. What are index numbers? Briefly discuss the problems in construction of index numbers.

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2021

BAS1C01 – Financial Mathematics

(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

PART- A (Short Answer)**Each question carries Two marks. Maximum 20 Marks**

1. Differentiate between an interest only loan and a repayment loan.
2. What is compound rate of interest?
3. Mila deposited Rs .50000 to an account at the start of year 2000, which pays an effective rate of interest of 12% pa. Calculate the amount left in her account at the end of year 2010
4. Briefly explain Flat rate and APR.
5. What is an index linked security?
6. Find the value of i , if $i^{(12)} = 5.5\%$.
7. Given that $I = 10$, $R=25$, $i=8\%$ and $n=10$, calculate the value of P .
8. What is inflation?
9. What is a deferred annuity?
10. Calculate the Present value at time 0 of an investment of 100000 at time 10 using an effective rate of interest of 8.5% per annum effective.
11. What is interest ?
12. What is the prospective method for loan calculation?

PART- B (Paragraph)**Each question carries Five marks. Maximum 30 Marks**

13. Derive an expression for the present value at time 0 of an immediate level annuity, where the level payment is Rs.1 payable in both Arrear and advance.
14. An investor puts £5,000 in a savings account that pays 10% simple interest at the end of each year. Compare how much the investor would have after 6 years if the money was:
 - a) Invested for 6 years
 - b) invested for 3 years, then immediately reinvested for a further 3 years

15. Sarah invested Rs.5000 in a savings account. The nominal rate of interest convertible monthly for the first year is 18% and the nominal rate of discount convertible quarterly for the next year is 20%. How much balance is in her account at the end of second year ?
16. A loan of £4,000 is repayable by equal monthly payments for 5 years. Interest is payable at a rate of 7% pa effective. Calculate the interest paid and the capital repaid in the 4th year.
17. Calculate the present value at time 0 of payments of Rs.120 at time 0, Rs.110 at time 1, Rs.100 at time 2 and so on. The last payment is at time 10. Assuming that the effective rate of interest per annum is 5%.
18. Given $i=10\%$, find the value of δ , $i^{(2)}$, $i^{(12)}$, v , d , $d^{(2)}$, $d^{(12)}$
19. The force of interest, $\delta(t)$, is given by:

$$\delta(t)=0.03-0.005t+0.001t^2 \quad 0 \leq t \leq 10$$

- a) Calculate the equivalent constant force of interest for the period $t = 0$ to $t = 10$.
- b) Calculate the accumulated value at time $t = 7$ of an investment of £250 at time $t = 0$

PART- C (Essay)

Each question carries Ten marks. Maximum 10 Marks

20. The force of interest is given by

$$\begin{aligned} \delta(t) &= 0.09 + 0.0006 t^2 & 0 \leq t < 9 \\ &0.1836 - 0.005t & 9 \leq t < 15 \\ &0.1086 & t \geq 15; \end{aligned}$$

where t is measured in years.

- a) Calculate the accumulated amount at the end of 17 years of Rs.5000 invested at time 0.
- b) Hence calculate the equivalent effective annual rate of interest over the 17 years period.
21. A bank lends a company £5,000 at a fixed rate of interest of 10% pa effective. The loan is to be repaid by five level annual payments. Calculate the interest and capital payments of each level repayment.

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester BVOC (AUTO) Degree Examination, November 2021

GEC1MT03 – Mathematics

(2020 Admission onwards)

Time: 2 ½ hours

Max. Marks: 80

PART A**All questions can be attended.
Each question carries 2 marks.**

1. A bus travels $5x^2$ meters in x seconds. Find Δx , Δy and average velocity during the time interval Δx if $x_0 = 3$ and $x = 4$.
2. Find $\lim_{x \rightarrow 3} \frac{x^2 - 4x + 3}{x^2 - 2x - 3}$
3. Find $\lim_{x \rightarrow \infty} \frac{6x + 5}{3x - 7}$
4. Differentiate $f(x) = 2x^3 - 5x^2 + 4x + 8$
5. Find the slope of the tangent line to the graph of $f(x) = \sqrt{x}$ at $x = 4$.
6. Define critical points of a function.
7. Discuss the concavity of $f(x) = x^2$.
8. Let $f(x) = x^3 - x^2 + x + 3$. How does f change sign at $x = -1$?
9. State Mean value theorem for derivative.
10. Evaluate $\int_2^4 (x^2 - 1) dx$
11. Find the volume of a ball of radius r .
12. Find the average value of $f(x) = x^3$ on $[0, 2]$
13. If $x = t^3$ and $y = t^5$, What is the slope of the tangent line?
14. Differentiate $\frac{x}{x^2 + 5}$
15. If $y = f(x)$ and $x^2 + y^2 = 1$, express dy/dx in terms of x and y .

[Ceiling = 25 Marks]

PART B

All questions can be attended.
Each question carries 5 marks.

16. Show that $f(x) = |x|$ has no derivative at $x = 0$, yet is continuous.
17. A train has position $3t^6 + 2t - 6$ at time t . Find the velocity and acceleration of the train at $t = 2$.
18. Find $f'(1)$ if $f(x) = (x^3 + 6)(x^2 - 1)$
19. Find the equation of the tangent line to the graph $f(x) = 1 - x^2$ at $x_0 = 1$.
20. Find the critical points of the function $f(x) = x^3 - x$. Are they local maximum or minimum points?
21. Find $\sum_{j=3}^{102} (j - 2)$
22. Draw the graph of the step function g on $[0,1]$ defined by

$$g(x) = \begin{cases} -1 & \text{if } 0 \leq x < \frac{1}{3} \\ 2 & \text{if } \frac{1}{3} \leq x \leq \frac{3}{4} \\ 2 & \text{if } \frac{3}{4} < x \leq 1 \end{cases}$$

Compute the signed area of the region between its graph and the x axis.

23. Find the area of the region bounded by the x axis, the y axis, the line $x = 2$ and the parabola $y = x^2$. Compute the area of the region.

[Ceiling = 35 Marks]

PART C

Answer any two questions
Each question carries 10 marks.

24. (a) A bagel factory produces $30x - 2x^2 - 2$ dollars worth of bagels for each x worker hours of labour. Find the marginal productivity when 5 worker hours are employed.
- (b) Calculate an approximate value for $\frac{4}{(0.99)^2 + \sqrt{0.99}}$
25. Sketch the graph of $f(x) = x - \frac{1}{x}$
26. The region under the graph of x^2 on $[0,1]$ is revolved about the x axis. Sketch the resulting solid and find its volume.
27. Find the area between the graphs $y = x^2 + 1$ and $y = x$ on $[-2,2]$

[2 x 10 = 20 Marks]