# Paper- 4: FUNDAMENTALS OF BUSINESS MATHEMATICS AND STATISTICS

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**Full Marks: 100** **Time Allowed: 3 Hours**

**Section – A**

**(Fundamentals of Business Mathematics)**

**PART A**

**1. Answer All objective questions.**

**(a) Answer Multiple Choice Question** **[9×2= 18]**

**i.** 20 litres of a mixture contain milk water in 5 : 3 ratio. If 4 litres of this mixture are replaced by 4 litres of milk, the ratio of milk water in the new mixture will be:

**(a)** 2 : 1

**(b)** 6 : 3

**(c)** 7: 3

**(d)** 8 : 3

**ii.** If $x = \log_{2a} a$, $y = \log_{3a} 2a$, $z = \log_{4a} 3a$, then xyz + 1 is equal to

**(a)** 2xy

**(b)** 2yz

**(c)** 2zx

**(d)** None of these.

**iii.** Find the present worth of an ordinary annuity of ₹1,200 p.a. for 10 years at 12% p.a. compounded annually.

[Use $(1.12)^{-10} = 0.3221$]

**(a)** ₹6,770

**(b)** ₹6,779

**(c)** ₹6,805

**(d)** None

**iv.** The sum of money that amounts to ₹1,110 in 10 years at the rate of 5% simple interest will be –

**(a)** ₹700

**(b)** ₹740

**(c)** ₹760

**(d)** ₹780

**v.** The number of ways in which 15 mangoes can be equally divided among 3 students is

**(a)** $\frac{15!}{(5!)^4}$

**(b)** $\frac{15!}{(5!)^3}$

**(c)** $\frac{15!}{(5!)^3}$

**(d)** None of these

**vi.** If $p^{th}$ , $q^{th}$ and $r^{th}$ terms of a G. P. be a, b, c respectively, then $a^{(q-r)}\ b^{(r-p)}\ c^{(p-q)} = ?$

**(a)** 0
**(b)** 1
**(c)** -1
**(d)** None.

**vii**. Which term of the A.P. 5, 8, 11, 14, ….. is 320?

**(a)** $104^{th}$
**(b)** $105^{th}$
**(c)** $106^{th}$
**(d)** $64^{th}$

**viii**. $\log_3\left(\frac{1}{243}\right) = ?$

**(a)** -5
**(b)** -6
**(c)** -9
**(d)** None of these

**ix**. The number of subsets of a set containing n elements is
**(a)** $2^n$
**(b)** $2^{-n}$
**(c)** n
**(d)** None of these

**(b) Answer the following Question True or False** **[6×1=6]**

**i.** If A : B = B : C = C : D = 5: 6 then A: B: C: D = 125 : 150 : 180: 216

**ii.** The SA. I at x% for x years will be Rs. X on a sum of x

**iii.** If the set A has 4 elements, B has 3 elements then the number of elements in A × B is 12 elements

**iv.** If $x = 2 + \sqrt{5}$ then $x^3 + 3x^2 - 29x$ is 7

**v.** The logarithm of 324 to base $\frac{1}{3\sqrt{2}}$ is – 4

**vi.** $X^2 - 4x - 1 = 0$ is the quadratic equation whose roots are $2 + \sqrt{5}$ and $2 - \sqrt{5}$

**PART B**

**4 questions to be answered out of 6 questions** **[4×4=16]**

**2.** In 165 litres of a quantity of milk mixed up with water, the ratio of milk and water is 9: 2. How much water must be added to it so as to make the ratio of milk and water 5 : 3? **[4]**

**3.** The difference between the simple and compound interest on a certain sum for 3 years at 5% p. a. is Rs.228.75 P. Find the compound interest on the sum for 2 years at 5% p. **[4]**

**4.** Solve 1 + 6 + 11 + 16 + …… + x = 148 **[4]**

**5.** Prove that $\frac{\log\sqrt{27} + \log 8 + \log\sqrt{1000}}{\log 120} = \frac{3}{2}$. **[4]**

**6.** If $^{11}P_r = {}^{12}P_{r+1}$ find the value of r. **[4]**

**7.** If one root of $px^2 + qx + r = 0$ be square of the other, prove that.

$q3 + p^2r + pr^2 = 3pqr$. **[4]**

**Section – B**

**PART A**

**8. Answer All objective questions.**

**(a) Answer Multiple Choice Question** **[12×2= 24]**

**(i)** Frequency density corresponding to a class interval is the ratio of

**(a)** Class frequency to the total frequency

**(b)** Class frequency to the class length

**(c)** Class length to the class frequency

**(d)** Class frequency to the total frequency.

**(ii)** Mean deviation from the mean for the observations 0, -1, 4 is

**(a)** 2
**(b)** 2/5
**(c)** 3/5
**(d)** None of these

**(iii)** The quartile deviation of 7, 10, 12, 15, 17, 19, 25 is

**(a)** 4.2
**(b)** 4.3
**(c)** 4.5
**(d)** None of these

**(iv)** If probability that horse A wins the race is 1/5 and that horse B wins is ¼. What is the probability that at least one of them wins the race?

**(a)** $\frac{1}{9}$

**(b)** $\frac{9}{20}$

**(c)** $\frac{1}{20}$

**(d)** $\frac{2}{5}$

**(v)** The rank correlation coefficient for 10 pair of observations is 0.5. Later it was noticed that the ranks to x & y are given as 2 & 9 are wrongly given as 4 & 7. The correct value of correlation coefficient is

**(a)** 0.20

**(b)** 0.24

**(c)** 0.26

**(d)** 0.28

**(vi)** The two lines of regression become identical when

**(a)** r = 1
**(b)** r = -1
**(c)** r = 0
**(d)** Both (a) & (b)

**(vii)** Pie-diagram is used for

**(a)** Comparing different components and their relation to the total

**(b)** Representing qualitative data in a circle

**(c)** Representing quantitative data in circle

**(d)** (b) or (c) .

**(viii)** Which of the following statements is false?

**(a)** Statistics is derived from the Latin word 'Status'

**(b)** Statistics is derived from the Italian word 'Statist'

**(c)** Statistics is derived from the French word 'Statistik'

**(d)** None of these

**(ix)** The variance of first five even natural numbers is

**(a)** $2\sqrt{2}$
**(b)** 8
**(c)** $2\sqrt[3]{2}$
**(d)** $4\sqrt{2}$

**(x)** If covariance between two variables x and y is 50 and the variance of x is 25 then the variance of variable y must be

**(a)** Less than 100

**(b)** More than 100

**(c)** At least 10

**(d)** At most 10

**(xi)** Two unbiased dice are thrown together. The probability that the sum of the digits on the dice is more than 8 is

**(a)** $\frac{5}{18}$

**(b)** $\frac{5}{12}$

**(c)** $\frac{13}{18}$

**(d)** $\frac{7}{12}$

**(xii)** For a normal distribution with mean 150 and S. D. 45; find $Q_1$ and $Q_3$:

**(a)** 119.35 and 190.65 respectively

**(b)** 180.35 and 119.65 respectively

**(c)** 119.65 and 180.35 respectively

**(d)** 123.45 and 183.65 respectively

**(b) Answer the following Question True or False [12×1=12]**

**(i)** Statistics are affected by a small number of causes.

**(ii)** A frequency distribution is the arrangement of the given data in the form of a table showing frequency with which each variables occurs.

**(iii)** Good average should be unduly affected by the presence of extreme values.

**(iv)** The geometric mean is obtained by multiplying the value of the item together and then taking it to its root corresponding to the number of items.

**(v)** Mode is the value that has maximum frequency.

**(vi)** Dispersion is a measure of variation of the items.

**(vii)** Correlation is an analysis of the co-variation between two or more variables.

**(viii)** Graphic method is also known as simple graph method.

**(ix)** A set of all possible outcomes from an experiment is called a sample space.

**(x)** The word odd is frequently used in statistics.

**(xi)** Regression analysis is not used in prediction and forecasting problems.

**(xii)** If $b_{xy}$ is positive, then $b_{yx}$ will also be positive.

**PART B**

**4 Questions to be answered out of 6 questions [6×4=24]**

**9.** Explain the Essential parts of a Statistical table. **[6]**

**10.** Find the average marks of a student from the follows table **[6]**

| Marks | No. of students |
|---|---|
| Below 10 | 25 |
| Below 20 | 40 |
| Below 30 | 60 |
| Below 40 | 75 |
| Below 50 | 95 |
| Below 60 | 125 |
| Below 70 | 190 |
| Below 80 | 240 |

**11.** The following table gives the weights of one hundred persons. Compute the co-efficient of dispersion by the methods of Limits (i. e. range) **[6]**

| Weight in lbs. Class interval | No. of persons |
|---|---|
| 85-95 | 4 |
| 95-105 | 13 |
| 105-115 | 8 |
| 115-125 | 14 |
| 125-135 | 9 |
| 135-145 | 16 |
| 145-155 | 17 |
| 155-165 | 9 |
| 165-175 | 8 |

| | |
|---|---|
| 175-185 | 2 |
| | 100 |

**12.** Quotations of index number of equity shares price of a certain joint stock company and of prices of preference shares are given below:

| Year | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
|---|---|---|---|---|---|---|---|
| Equity Shares | 97.5 | 99.4 | 98.6 | 92.2 | 95.1 | 98.4 | 97.1 |
| Preference Shares | 75.1 | 75.9 | 77.1 | 78.2 | 79.0 | 74.8 | 76.2 |

Use the method of rank correlation to determine the relationship between Equity share and preference share prices. **[6]**

**13.** Find both the regression equations from the following: **[6]**

$\sum X = 60$ $\sum Y = 40$ $\sum XY = 1150$

$\sum X2 = 4160$ $\sum Y2 = 1720$ $N = 10$

**14.** An urn contains 3 white balls, 4 red balls and 5 black balls. Two balls are drawn. What is the probability that

(i) both are red?

(ii) both are white?

(iii) one red and one white? **[6]**