Paper 4 - Fundamentals of Business Mathematics and Statistics

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

The figures in the margin on the right side indicate full marks.
This question paper has two sections.
Both the sections are to be answered subject to instructions given against each.

Section – A

I. (a) Choose the correct answer **(9 × 2 = 18)**

(1) The ratio of present age of Jadu to that of Madhu is 4 : 5. If the present age of Madhu is 30 years, then the present age of Jadu is –
(a) 20 years (b) 25 years (c) 24 years (d) 35 years.

(2) A sum of money becomes double in 20 years at S.I. In how many years will it be triple –
(a) 40 (b) 35 (c) 38 (d) 42

(3) Compound interest on ₹ 1000 at 8% p.a. compounded half-yearly for 2 years is –
(a) 169.90 (b) 196.60 (c) 175.10 (d) 199.40

(4) A boy saves 1p today, 2p tomorrow, 3p day after tomorrow. How much he can save in 12days?
(a) 68 (b) 70 (c) 78 (d) 87

(5) The product of three terms in G.P. is 1000. What is its middle term?
(a) 12 (b) 14 (c) 16 (d) 10

(6) In a group of 63 persons, 24 persons take wheat but not rice, 37 persons take wheat then find the number of persons taking rice but not wheat?
(a) 39 (b) 26 (c) 62 (d) None.

(7) If $3^x = 5^y = (225)^z$ then z = ___
(a) $\frac{xy}{x+y}$ (b) $2\frac{xy}{x+y}$ (c) 2(x+y) (d) None of these

(8) If ${}^8c_r - {}^7c_3 = {}^7c_2$ then r = _____
(a) 3 (b) 4 (c) 2 (d) 6

(9) If the roots of the equation $\frac{3}{4}x^2 + 9x + c^3 = 0$ are equal then c is equal to _____
(a) 5 (b) 3 (c) 8 (d) 5

I. (b) State whether the following statements are true or false **(6 × 1 = 6)**

(1) The mean proportional of 4x and $16x^3$ is $12x^2$ ( )

(2) $1+2+3+\ldots\ldots\ldots+(n-1) = \frac{n(n-1)}{2}$ ( )

(3) The G.M of 2 and 6 is $\pm\sqrt[3]{2}$ ( )

(4) The statement {2} belongs to {2, 3, 5} is true or false ( )

(5) The integral part of the value of logarithm of a number is called characteristic ( )

(6) The total number of arrangements of the letters in the expression $x^3y^2z^4$ when written in full length is 1260 ( )

II. Answer any four questions. Each question carries 4 marks (4 × 4 = 16)

(1) If $\frac{\sqrt{a}-\sqrt{b}}{\sqrt{a}+\sqrt{b}}=\frac{1}{2}$ prove that $\frac{a^2+ab+b^2}{a^2-ab+b^2}=\frac{91}{73}$

(2) A sum of ₹ 46,875 was lent out at simple interest and at the end of 1 year 8 months the total amount was ₹ 50,000. Find the rate of interest p.a.

(3) Find the sum of n terms of the series
0.7 + 0.77 + 0.777 + …… to n terms.

(4) If $a = b^2 = c^3 = d^4$ prove that $\log_a(abcd) = 1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}$

(5) Find n if ${}^{n}P_3 : {}^{n+2}P_3 = 5 : 12$

(6) Solve $\sqrt{\frac{x}{1-x}}+\sqrt{\frac{1-x}{x}}=\frac{13}{6}$

Section – B

III. (a) Choose the correct answer (12 × 2 = 24)

(1) If the co-efficient of correlation between x and y is ¾ and the standard deviation of x is 4 and standard deviation of y is 3, the covariance between x and y will be _____
(a) 9 (b) 6 (c) 7 (d) 8

(2) The middle most value of a frequency distribution table is known as
(a) Mean (b) Median (c) Mode (d) Range

(3) The Harmonic mean for the series 6, 5, 3, 6, 7, 10 and 12 is ……..
(a) 5.87 (b) 6.21 (c) 5.12 (d) 5.98

(4) If Median = 5, Quartile Deviation = 2.5 then the co-efficient of Quartile Deviation is _____
(a) 20 (b) 50 (c) 125 (d) 5

(5) What is the co-efficient of range for the following wages of 8 workers? ₹ 80, ₹ 65, ₹ 90, ₹ 60, ₹ 75, ₹ 70, ₹ 72, ₹ 85
(a) ₹ 30 (b) ₹ 20 (c) ₹ 30 (d) ₹ 20

(6) For a moderately skewed distribution of marks in statistics for a group of 100 students, the mean mark and median mark were found to be 50 and 40. What is the modal mark?
(a) 15 (b) 20 (c) 25 (d) 30

(7) If x and y satisfy the relationship y = -5 + 7x, the value of r is
(a) 0 (b) -1 (c) +1 (d) None

(8) When one regression co-efficient is positive, the other would be
(a) Negative (b) Positive (c) Zero (d) None of them

(9) The line $y = 13 - \frac{3x}{2}$ is the regression equation of
(b) y on x (b) x on y (c) both (d) none

(10) The odds in favour of one student passing a test are 3 : 7. The odds against another student passing at are 3 : 5. The probability that both pass is
(a) 7/16 (b) 21/80 (c) 9/80 (d) 3/16

(11) Probability of throwing an even number with an ordinary six faced dice is
(a) ½ (b) 0 (c) 1 (d) - ½

(12) If the relationship between two variables x and y is given by 2x + 3y + 4 = 0, then the value of the correlation co-efficient between x and y is
(a) 0 (b) 1 (c) -1 (d) Negative

III. (b) State whether the following statements are true or false **(12 × 1 = 12)**

(1) Mode is the value that has maximum frequency ( )

(2) The sum of individual observations from mean is zero ( )

(3) There is no difference between co-efficient of variation and variance ( )

(4) Median can never be equal to mean in a skewed distribution ( )

(5) If events are mutually exclusive then their probabilities are less than one ( )

(6) Sum of probability of an event A and its complements is 1 ( )

(7) If x and y satisfy the relationship y = -5 +7x, the value of r is zero ( )

(8) In the line $y = 19 - \frac{5x}{2}$, b_{yx} is equal to -5/2 ( )

(9) The slope of the regression line of y on x is b_{yx} ( )

(10) Two regression line coincide when r = 2 ( )

(11) In a moderately asymmetrical distribution A.M. < G.M. < H.M. ( )

(12) In a normal distribution SD > MD > QD ( )

IV. Answer any four questions. Each question carries 6 marks (4 × 6 = 24)

(1) Draw a histogram of the following frequency distribution showing the number of boys in the register of a school.

Age (in years)	No. of boys (in '000)
2-5	15
5-8	20
8-11	30
11-14	40
14-17	25
17-20	10

(2) Find A.M. of the following distributions:

	₹	c.f.		Marks	c.f.
(i)	less than 4	2	(ii)	More than 0 and above	10
	less than 8	6		More than 5 and above	8
	less than 12	13		More than 10 and above	5
	less than 16	18		More than 15 and above	1
	less than 20	20		More than 20 and above	0

(3) Find the standard deviation of the following series:

x	f
10	3
11	12
12	18
13	12
14	3
Total	48

(4) The following data gives the distribution of the total population and those who are totally or partially blind among them. Find out Karl Pearson's coefficient of correlation.

Age (in years)	No. of persons (in '000)	Blind
15	80	12
16	100	30
17	120	48
18	150	90
19	200	150
20	250	200

(5) By using the following data, find out the two lines of regression.
$\Sigma X = 250$, $\Sigma Y = 300$, $\Sigma XY = 7900$, $\Sigma X^2 = 6500$, $\Sigma Y^2 = 10000$, $N = 10$.

(6) Box I contains three defective and seven non-defective balls, and Box II contains one defective and nine non-defective balls. We select a box at random and then draw one ball at random from the box.
   (a) What is the probability of drawing a non-defective ball?
   (b) What is the probability of drawing a defective ball?