Paper- 4: FUNDAMENTALS OF BUSINESS MATHEMATICS AND STATISTICS

Paper- 4: FUNDAMENTALS OF BUSINESS MATHEMATICS AND STATISTICS

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

Section – A
(Fundamentals of Business Mathematics)

I. Answer any TWO questions. Each question carries 5 marks [2×5 = 10]

1. How many numbers between 5000 and 6000 can be formed with the digits 3, 4, 5, 6, 7, 8?

2. If $x = \log_{2a} a$, $y = \log_{3a} 2a$, $z = \log_{4a} 3a$, Show that : $xyz + 1 = 2yz$.

3. Find A + A' where $A = \begin{bmatrix} 2 & 5 \\ 7 & 8 \end{bmatrix}$ & Prove A + A' is symmetric

II. Answer any TWO questions. Each question carries 3 marks [2 × 3 = 6]

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

5. Show that $\left(\frac{x^b}{x^c}\right)^a \times \left(\frac{x^c}{x^a}\right)^b \times \left(\frac{x^a}{x^b}\right)^c = 1$

6. Find $\lim_{x} \frac{5 - 2x^2}{3x + 5x^2}$

III. Choose the correct answer [5 × 1 = 5]

7. f (x) = 2x – 1 × 1 is continuous at x = _____
   (a) 0
   (b) -1
   (c) 2
   (d) None of these

8. Some money is distributed between A and B in the ratio 2 : 3. If A receives ₹72 then B receives –
   (a) ₹90
   (b) ₹144
   (c) ₹108
   (d) None of these

9. $\frac{1}{\log_a bc + 1} + \frac{1}{\log_b ca + 1} + \frac{1}{\log_c ab + 1}$ is equal to _____
   (a) 1
   (b) 2
   (c) 3/2
   (d) None of these

10. If ${}^nP_3 = 120$ then n = _____
    (a) 8
    (b) 4
    (c) 6
    (d) None of these

11. $\int \frac{dx}{x\log x}$ = _____

(a) logx

(b) $\frac{1}{\log x}$

(c) $\frac{1}{\log(\log x)}$

(d) log (log x)

IV. Fill in the blanks [5 ×1= 5]

12. $\left(\frac{1}{2}+\frac{1}{3}\right):\left(\frac{1}{2}\times\frac{1}{3}\right)$ = _____

13. If $64^x = 2\sqrt{2}$ then x = _____

14. If 3, x, 27 are in continued proportion then x = _____

15. If $\begin{pmatrix} 2 & 1 & 4 \\ 1 & 0 & 3 \end{pmatrix}$ then a_{22} = _____

16. $\int \log x\, dx$ = _____

V. State whether the following statements are true or false [5×1= 5]

17. $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is called singular matrix if ac – bd = 0.

18. The statement "I am hungry I will eat something" is true or false.

19. The fourth proportional of ₹ 5, ₹ 3.50, 150gm is 125gms.

20. The total number of 9 digits numbers which have all different digits is $9 \times L9$.

21. $\int_0^1 e^x dx = e+1$

VI. Match the following [5× 1 = 5]

22. If $\frac{a}{5}=\frac{b}{4}=\frac{c}{9}$ then $\frac{a+b+c}{c}$ =_____	A	3 × 2
23. $(A^c)^c$	B	7
24. The order of a matrix is 2 × 3 then order of its transpose is _____	C	$\frac{1}{2}\log\frac{19}{7}$
25. ${}^nc_{n-2} = 21$ then n = _____	D	A
26. $\int_2^8 \frac{dx}{2x+3}$ = _____	E	2

VII. Answer the following in one or two steps [9×2] = 18

27. In a class each student plays either Cricket (or) Foot Ball. If 50 students plays football, 30 students play Cricket while 15 students play both, then find number of students in a class.

28. Find $A_{2\times 3}$ when $a_{ij} = i + 2j$

29. Evaluate $\lim_{x\to\infty} \frac{x-12}{x^2-144}$

30. The average cost function (AC) for certain commodity is $AC = 2x - 1 + \frac{50}{x}$ in terms of output x. Find the Marginal Cost.

Section – B

VIII. Answer any Nine questions of the following. Each question carries 2 marks [9 × 2 = 18]

1. Two dice are thrown together. The probability that 'the event the difference of nos. shown is 2' is

(a) 2/9
(b) 5/9
(c) 4/9
(d) 7/9

2. If r = 0.6 then the coefficient of non-determination is

(a) 0.4
(b) -0.6
(c) 0.36
(d) 0.64

3. The number of accidents for seven days in a locality are given below:

C	0	1	2	3	4	5	6
Frequency	15	19	22	31	9	3	2

What is the number of cases when 3 or less accident occurred?

(a) 56
(b) 6
(c) 68
(d) 87

4. If x and y are related as 4x + 3y + 11 = 0 and mean deviation of x is 2.70. What is mean deviation of y?

(a) 7.20
(b) 14.40
(c) 3.60
(d) None of these

5. The mean height of 8 students is 152 cm. Two more students of heights 143 cm and 156 cm join the group. New mean height is equal to

(a) 153

(b) 152.5

(c) 151.5

(d) 151

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. 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 fall is
   (a) 7/16
   (b) 21/80
   (c) 9/80
   (d) 3/16

8. The mean height of 8 students is 152 cm. Two more students of heights 143 cm and 156 cm join the group. New mean height is equal to
   (a) 153
   (b) 152.5
   (c) 151.5
   (d) 151

9. What is the HM of 1, ½, 1/3, …. 1/n?
   (a) n
   (b) 2n
   (c) $\frac{2}{(n+1)}$
   (d) $\frac{n(n+1)}{2}$

10. A and B are two events such that P(A) = 1/3, P(B)=1/4, P(A+B)=1/2 then P(B/A) is equal to
    (a) ¼
    (b) 1/3
    (c) ½
    (d) none of these

11. If the quartile deviation of x is 8 and 3x + 6y = 20, then the quartile deviation of y is
    (a) -4
    (b) 3
    (c)
    (d) 5
    (e) 4

12. If x and y are related by x-y-10=0 and mode of x is known to be 23, then the mode of y is
    (a) 20
    (b) 13
    (c) 3
    (d) 23

IX. Answer any Nine question of the following. Each question carries 2 marks [9 ×2]= 18

1. If for two numbers, the mean is 25 and the Harmonic mean is 9, what is the geometric mean?
2. An aeroplane covers the four sides of a square at varying speeds of 500, 1000, 1500, 2000 km per hour respectively. What in the average speed of the plane around the square.
3. Three series with equal terms and equal Mean have S.D.'s 6, 7, 8; Find combined S.D.
4. Find the third decile for the numbers 15, 10, 20, 25, 18, 11, 9, 12.

5. For a moderately skewed distribution, arithmetic mean = 160, mode = 157 and standard deviation = 50, Find Karl Pearson coefficient of Skewness.
6. What is the modal value for the numbers 4, 3, 8, 15, 4, 3, 6, 3, 15, 3, 4.
7. Two dice are thrown at a time and the sum of the numbers on them is 6. Find the probability of getting the number 4 on anyone of the dice.
8. If two regression coefficients b_{xy} = 0.87 and b_{yx} = 0.49, find 'r'.
9. The probability that A can solve a problem is 2/3 and that B can solve is 3/4. If both of them attempt the problem, what is the probability that the problem get solved?
10. If two regression coefficients are 0.8 and 1.2 then what would be the value of coefficient of correlation?
11. Two cards are drawn from a well shuffled pack of playing cards. Determine the probability that both are aces.
12. If P(A)=1/4, P(B) = 1/2, P(A U B) = 5/8, then P(A ∩ B) is:

13. Answer any FOUR of the following questions [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) To find the median of the following

x :	1	2	3	4	5	6
y :	7	12	17	19	21	24

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

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

(4) From the following data, calculate Karl pearson's coefficient of correction

Height of fathers (in inches)	66	68	69	72	65	59	62	67	61	71
Height of sons (in inches)	65	64	67	69	64	60	59	68	60	64

(5) Compute i) Laspeyre's, ii) Paasche's iii) Dorbish and Bowley's Price Index Numbers for the following data:

Commodity	2002	2003

	Price	Quantity	Price	Quantity
A	5	10	4	12
B	8	6	7	7
C	6	3	5	4

(6) A university has to select an examiner from a list of 50 persons, 20 of them women and 30 men, 10 of them knowing Hindi and 40 not. 15 of them being teachers and the remaining 35 not. What is the probability of the University selecting a Hindi-knowing women teacher ?