Paper- 4: FUNDAMENTALS OF BUSINESS MATHEMATICS AND STATISTICS

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

Section – A

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

1. There has been increment in the wages of labourers in a factory in the ratio of 22:25, but there has also been a reduction in the number of labourers in the ratio of 15:11. Find out in what ratio the total wage bill of the factory would be increased (or) decreased.
2. If $\log_a bc = x$, $\log_b ca = y$ and $\log_c ab = z$ then prove that $\frac{1}{x+1}+\frac{1}{y+1}+\frac{1}{z+1}=1$
3. A steel plant produces x tons of steel per week at a total cost of $\frac{1}{3}x^3 - 7x^2 + 11x + 50$ Find the output level at which the marginal cost attains its minimum.

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

4. The difference between the simple interest and compound interest on a sum put out for 2 years at 5% was `6.90. Find the sum.
5. If $(1.234)^a = (0.1234)^b = 10^c$ show that $\frac{1}{a} - \frac{1}{c} = \frac{1}{b}$
6. A function is defined as follows:

   f(x) = 2x -1 x <3
   = k x =3
   = 8 – x x>3

   For what value of k, f(x) is continuous at x = 3?

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

7. A fraction which bears the same ratio to $\frac{1}{27}$ that $\frac{3}{11}$ does to $\frac{5}{9}$ is

   a) $\frac{1}{55}$ b) 55 c) $\frac{1}{11}$ d) $\frac{3}{11}$

8. If $A \propto B^2$ and A = 4 then B = 4 when A =3 the value of B^2 is ____

   a) 12 b) 16 c) 9 d) None of these

9. 3 times of a number is equal to 3/5 of its square. The number is ___

   a) 8 b) 7 c) 9 d) 5

10. If y = log (2x +5) then $\frac{dy}{dx}$ is equal to ____

    a) $\frac{2}{x+5}$ b) $\frac{2^x}{2x+5}$ c) $\frac{2}{2x+5}$ d) $\frac{1}{2x+5}$

11. $\int_2^4 3\,dx$ equal to___

a) 3 b) 11 c) 2 d) $\frac{1}{2}$

IV. Fill in the blanks [5 ×1 = 5]

12. The simple interest at x% for x years will be ` x on a sum of ____
13. Everybody in a room shakes hands with everybody else. The total number of handshakes is 66. The total number of persons in the room is_____
14. If the roots of the equation $x^2+6x + c = 0$ are equal then c =
15. If $f(x) = 2x^2 – 5x + 4$ and $2f(x) = f(2x)$ then x = ___
16. $\lim_{n\to\infty} \frac{1}{7}+\frac{1}{7^2}+.....\frac{1}{7^n}=$_____

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

17. If 15% of x is the same as 20% of y then x:y is 4:3 ( )
18. A matrix is said to be rectangular if it has unequal numbers of rows and columns ( )
19. A polygon has 44 diagonals then the number of its sides are 8 ( )
20. $\lim_{x\to 3} \frac{x^2-4}{x+1}=\frac{23}{7}$
21. The demand function of product is $D=12–x^2$ then Marginal Revenue function will be $– 2x$ ( )

VI. Match the following [5 × 1=5]

22. The time when the Amount will be due if the discount on `1,060 be `60 at 6% p.a.		F) 1
23. 2x + 3y – 5 = 0 and kx – 6y – 8 = 0 have unique solution if k = ---- ----		G) ½
24. If $A=\begin{bmatrix} x-2 & 4 \\ 3 & 5 \end{bmatrix}$; $B=\begin{bmatrix} -1 & 4 \\ 3 & 5 \end{bmatrix}$ and A = B then x = ____		H) 4
25. $\lim_{x\to 0} \frac{1-\sqrt{1-x^2}}{x^2}$		I) $\frac{2}{3}$ years
26. $\int_1^2 xe^x dx$ =		J) $2e^2$

VII. Answer the following in one or two steps [4 × 1 = 4]

27. Find A Δ B if A = {1,2, 3} and B = {1, 2, 3, 4}
28. Using the connecting word "or" write the compound statement of "√5 is a rational number. √5 is an irrational number"
29. Find 'x' where Ax = B and $A=\begin{bmatrix} 1 & 2 \\ 9 & 4 \end{bmatrix}$; $B=\begin{bmatrix} 3 & 12 \\ 13 & 52 \end{bmatrix}$
30. Solve the inequality $-2 (m-3) < 5(m+1) -12$

Section – B

1. Answer any Nine questions of the following [9× 2 = 18]

Each question carries 2 marks

(i) "Stub" of table is the

a) Left part of the table describing the columns
b) Right part of the table describing the columns
c) Right part of the table describing the rows

d) Left part of the table describing the rows

(ii) Weights are generally called –

a) Range b) Mean c) Frequencies d) Mode

(iii) The mean salary for a group of 40 female workers is 5200 per month and that for a group of 60 male workers is 6800 per month. What is the combined mean salary?

a) 6500 b) 6200 c) 6160 d) 6100

(iv) The greater of the two numbers whose arithmetic mean is 34 and the geometric mean is 16

a) 4 b) 256 c) 68 d) 64

(v) For a moderately skewed distribution, which of he following relationship holds?

a) Mean – mode = 3 (mean – median)

b) Median – Mode = 3 (Mean – Median)

c) Mean – Median = 3 (Mean – Mode)

d) Mean – Median = 3 (Median – Mode)

(vi) For a group of 8 students, the sum of squares of differences in ranks for Maths and Stats mark was found to be 50. What is the value of rank correlation coefficient?

a) 0.23 b) 0.40 c) 0.78 d) 0.92

(vii) Age of Applicants for life insurance and the premium of Insurance – correlations are

a) Positive b) Negative c) Zero d) None

(viii) If for two independent events A and B, P(AUB)=2/3 and P(A) = 2/5, what is P(B)?

a) 4/15 b) 4/9 c) 5/9 d) 7/15

(ix) A number of selected from the set S = {1, 2, 3, 4..25}. The probability, that it would be divisible by 4 or 7, is

a) 0.26 b) 0.46 c) 0.36 d) None

(x) X is a Poisson variate satisfying the following relation: P(X = 2) = 9 P(x = 4) + 90P (X = 6). What is the standard deviation of X?

a) 1 b) 2 c) 1.55 d) 1.87

(xi) For a Poisson variate X, P(X=1) = P(X=2). What is the mean of X?

a) 1.00 b) 1.50 c) 2.00 d) 2.50

(xii) From the following data for the 5 groups combined

Group	Weight	Index Number
Food	35	425
Cloth	15	235
Power and Fuel	20	215
Rent and Rates	8	115
Misc.	22	150

The general index number is

a) 270

b) 269.2

c) 268.5

d) 272.5

2. Answer any Nine question of the following [9×2 = 18]

Each question carries 2 marks

i) An area diagram is ____

ii) The following data relate to the income of 86 persons:

Income in `	No. of Persons
500 - 999	15
1000 - 1499	28
1500 - 1999	36
2000 - 2499	7

What is the percentage of persons earning more than `1,500?

iii) If the median of 5, 9, 11, 3, 4, x, 8 is 6. Find the value of x

iv) What is the value of the first quartile for observations 15, 18, 10, 20, 23, 28, 12, 16?

v) Median divides the total number of observations into _____ parts

vi) The correlation coefficient being -1 if the slope of the straight line in a scatter diagram is _____

vii) If for two variable X and Y, the covariance, variance of X and variance of Y are 40, 16 and 256 respectively, what is the value of the correlation coefficient?

viii) The odds in favour of one student passing a test are 3:7. The odds against another student passing at are 3:5. Find the probability that both pass

ix) 4 coins are tossed. Find the probability that there are 2 heads.

x) In Binomial distribution if mean = 20, SD=4 Find the value of q

xi) What is the probability of getting 3 heads if 6 unbiased coins are tossed simultaneously?

xii) From the following data find Fisher's Ideal Index Number.

Commodity	Base Year		Current Year	
	Price	Qty	Price	Qty
A	4	3	6	2
B	5	4	6	4
C	7	2	9	2
D	2	3	1	5

3. Answer any FOUR of the following question [4×6=24]

i. Draw the two ogives from the following data and locate Median

Class Interval	100-200	200-300	300-400	400-500	500-600	600-700
Frequency	12	18	30	42	60	78

ii. Compute semi-inter quartile range, coefficient of Q.D for following data:

X	0-4	4-8	8-12	12-16	16-20	20-24	24-28	28-32
F	4	9	23	55	62	30	12	5

iii. Find the rank correlation for the following distribution

Marks in Economics	48	60	72	62	56	40	39	52	30
Marks in Accountancy	62	78	65	70	38	54	60	32	31

iv. Find fisher Index No. from following data and show that it satisfies T. R. T and F. R. T

	2001		2005	
Commodity	Quantity	Value	Quantity	Value
A	5	40	6	60
B	5	30	5	40
C	6	24	6	30
D	5	10	10	40

v. Fit a straight line trend for the following data and find the trend values. Estimate sales for 2018.

Year	2007	2008	2009	2010	2011	2012	2013
Sales (`'000)	33	35	60	67	68	82	90

vi. In an experiment on tossing a coin 'n' times, if the variable x denotes the number of heads and P(x =4), P(x = 5), P(x =6) are in A.P then find the value of 'n'.