Paper 4-Fundamentals of Business Mathematics and Statistics

SET - I

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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.   **In a class containing 50 students, 15 play tennis, 20 play cricket and 20 play Hockey, 3 play Tennis and Cricket, 6 play Cricket and Hockey and 6 play Tennis and Hockey, 7 play no game at all. How many play Cricket, Tennis and Hockey?**

2.   **Find two positive numbers whose product is 16 having minimum sum.**

3.   **The total cost function of a firm is c = $\frac{1}{3}$ x³ – 3x² + 10x + 10 where c is the total cost and x is output.**

     A tax at the rate of ₹ 2 per unit of output is imposed and the producer adds it to his cost. If the market demand function is given by p = 2512 – 3x, where p is the price per unit of output. Find the profit maximizing output and hence the price.

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 the matrix 'X' where AX = B and A = $\begin{pmatrix} 1 & 2 \\ 9 & 4 \end{pmatrix}$ and B = $\begin{pmatrix} 3 & 12 \\ 13 & 52 \end{pmatrix}$**

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

7.   **If the numerator is multiplied by it becomes equal to 1 however if 2 is deducted from denominator it becomes equal to 1. The number is ____**
     (a) 5/7
     (b) 3/7
     (c) 5/8
     (d) 1/3

8.   **If $^np_3$ = 120 then n = ___**
     (a) 8
     (b) 4
     (c) 6
     (d) None of these

9. If A = $\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ then transpose of the transpose of A = _____

   (a) $\begin{pmatrix} 2 & 5 \\ 4 & 3 \end{pmatrix}$

   (b) $\begin{pmatrix} 2 & 5 \\ 3 & 4 \end{pmatrix}$

   (c) $\begin{pmatrix} 2 & 4 \\ 3 & 5 \end{pmatrix}$

   (d) $\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$

10. 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

11. Set of even positive integers less than equal to 6 by selector method.
    (a) {x / < 6}
    (b) {x/x = 6}
    (c) {x/x ≤ 6}
    (d) None of these

IV. Fill in the blanks   [5 × 1 = 5]

12. The C.I on a certain sum of money for 2 years at 8% p.a. compounded annually is ₹ 1040. The sum is _____

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

14. If A and B are two sets then A ∩ (B – A) is _____

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

16. If $y = (\sqrt{x} + 1)^2$ then $\dfrac{dy}{dx}$ = _____

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

17. If the ratio of two positive numbers is 4:5 and their L.C.M is 140 then the numbers are 35, 45.

18. The number of different words that can be formed from the letters of the word "TRIANGLE" so that no two vowels come together is 36000.

19. The total number of 9 digits numbers which have all different digits is 9 × $\lfloor 9$.

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

21. f and g are two continuous functions of their common domain D then f – g is continuous.

VI. Match the following [5 × 1 = 5]

22.	If $\dfrac{a}{5}=\dfrac{b}{4}=\dfrac{c}{9}$ then $\dfrac{a+b+c}{c}$ = _____	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	$\dfrac{1}{2}\log\dfrac{19}{7}$
25.	$^nC_{n-2}$ = 21 then n = _____	D	A
26.	$\displaystyle\int_2^8 \dfrac{dx}{2x+3}$ = _____	E	2

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

27. Construct the truth table for "p → q".
28. Draw the graph of x + y ≤ 1, 3x + y ≥ 3   x ≥ 0, y ≥ 0
29. 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.
30. Evaluate $\displaystyle\lim_{x \to 12} \dfrac{x-12}{x^2-144}$

Section – B
(Fundamentals of Business Statistics)

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

1. The variables x and y are related by 5x+6y=70 and median of x is 8. What is the median of y?
   (a) 4
   (b) 4.5
   (c) 6
   (d) 5

2. In Ogive, obscissa corresponding to ordinate N/2 is
   (a) Median
   (b) 1st quartile
   (c) 3rd quartile
   (d) None

3. 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

4. (Class frequency) / (Width of the class) is defined as
   (a) Frequency density
   (b) Frequency distribution
   (c) Both
   (d) None

5. 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

6. If median = 12, Q_1 = 6, Q_3 = 22 then the coefficient of quartile deviation is
   a) 33.33
   b) 60
   c) 66.67
   d) 70

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

8. The sum of the difference of rank is
   a) 1
   b) -1
   c) 0
   d) None

9. If r = 0.6 then the coefficient of non-determination is
   a) 0.4
   b) -0.6
   c) 0.36
   d) 0.64

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

11. What is the probability that a leap year selected at random would contain 53 Saturdays?
    a) 1/7
    b) 2/7
    c) 1/12
    d) ¼

12. 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) $\dfrac{1}{4}$
    b) 1/3
    c) ½
    d) none of these

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

1. Find the third decile for the numbers 15, 10, 20, 25, 18, 11, 9, 12.

2. What is the modal value for the numbers 4, 3, 8, 15, 4, 3, 6, 3, 15, 3, 4.

3. A class of 40 students has an average of 56 marks in Math exam. But later on it was found that terms 48, 54 and 67 were misread as 68, 45 and 87. Find correct mean.

4. If for two numbers, the mean is 25 and the Harmonic mean is 9, what is the geometric mean?

5. In a Moderately Asymmetrical Distribution Compute M.D. and S.D. Given Q.D. = 50

6. Three series with equal terms and equal Mean have S.D.'s 6, 7, 8; Find combined S.D.

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

8. If two regression coefficients are 0.8 and 1.2 then what would be the value of coefficient of correlation?

9. If $\bar{X}$ = 56.2 , Z = 55; Find M

10. 4 coins are tossed. Find the probability that at least one head turns up.

11. If P(A)=1/4, P(B) = 1/2, P(AUB) = 5/8, then P(A∩B) is:

12. The probability that a number selected at random from the set of numbers {1,2,3,....,100} is a cube is:

X. 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. Find mode

Class interval	below 10	10-15	15-20	20-25	25-30	above 30
Frequency	21	47	67	89	55	21

3. Find the standard deviation of the following series:

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

4. Given the bivariate data

X	2	6	4	3	2	2	8	4
Y	7	2	1	1	2	3	2	6

Find Co-efficient of Correlation.

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. Two students X and Y work independently on a problem. The probability that X will solve it is (3/4) and the probability that Y will solve it is (2/3). What is the probability that the problem will be solved?