

**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)

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

- Two numbers are in the ratio of 3 : 5 and if 10 be subtracted from each of them, the remainders are in the ratio of 1 : 5, find the numbers.
- A sum of money invested at C.I payable yearly amounts to ₹10,816 at the end of the second year and to ₹ 11,248.64 at the end of the third year. Find the rate of interest and the sum.
- Show that  $\log_3 \sqrt{3\sqrt{3\sqrt{3\cdots\infty}}} = 1$

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

- If  $y = \log(x + \sqrt{x^2 + a^2})$  then find  $(a^2 + x^2) y_2 + xy_1$
- What sum of money will produce ₹28,600 as an interest in 3 years and 3 months at 2.5% p.a. simple interest?
- If  $a = 2^{\frac{1}{3}} - 2^{-\frac{1}{3}}$  show that  $2a^3 + 6a - 3 = 0$

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

- If  $A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$  then transpose of the transpose of A = \_\_\_\_
  - $\begin{pmatrix} 2 & 5 \\ 4 & 3 \end{pmatrix}$
  - $\begin{pmatrix} 2 & 5 \\ 3 & 4 \end{pmatrix}$
  - $\begin{pmatrix} 2 & 4 \\ 3 & 5 \end{pmatrix}$
  - $\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$
- Set of even positive integers less than equal to 6 by selector method.
  - $\{x / x < 6\}$
  - $\{x/x = 6\}$
  - $\{x/x \leq 6\}$
  - None of these
- $\left[ \log\left(\frac{a^2}{bc}\right) + \log\left(\frac{b^2}{ac}\right) + \log\left(\frac{c^2}{ab}\right) \right]$  is equal to -
  - 0
  - 1
  - 2
  - abc

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10. The ratio  $\frac{5}{3} : 2\frac{1}{4}$  is -
- ratio of lesser inequality
  - ratio of greater inequality
  - 20 : 9
  - 5 : 27
11. 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 \_\_\_\_
- 5/7
  - 3/7
  - 5/8
  - 1/3

IV. Fill in the blanks

[5 × 1 = 5]

12. If A and B are two sets then  $A \cap (B - A)$  is \_\_\_\_\_
13. If A and B are two disjoint sets then  $x(A \cup B)$  is equal to \_\_\_\_
14. The C.I on a certain sum of money for 2 years at 8% p.a. compounded annually is ₹ 1040. The sum is \_\_\_\_\_
15. If  $y = (\oplus x + 1)^2$  then  $\frac{dy}{dx} =$  \_\_\_\_\_
16. There are 10 points in a plane and among them 4 are collinear. The total number of triangles formed by joining them is \_\_\_\_

V. State whether the following statements are true or false

[5 × 1 = 5]

17. 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.
18. The statement  $\{2\} \otimes \{2, 3, 5\}$  is true or false.
19. The decimal part of the value of logarithm of a number is called mantissa.
20. If the ratio of two positive numbers is 4:5 and their L.C.M is 140 then the numbers are 35, 45.
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 $\frac{A}{3} = \frac{B}{4} = \frac{C}{5}$ then A:B:C = ____	A	4
23.	$\log_{10000} X = -\frac{1}{4}$ then x = ____	B	$\log_e\left(\frac{3}{2}\right)$
24.	If $(n + 1)! = 20(n - 1)!$ then n = ____	C	$\frac{1}{10}$
25.	$\lim_{x \rightarrow 0} \frac{3^x - 2^x}{x} =$ ____	D	1
26.	If $A = \begin{pmatrix} x-2 & 4 \\ 3 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 4 \\ 3 & 5 \end{pmatrix}$ and $A = B$ then x = ____	E	3 : 4 : 5

## Answer to MTP\_Foundation\_Syllabus 2012\_Dec2017\_Set 2

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- VII. Answer the following in one (or) two steps [4 × 1 = 4]
27. Draw the graph of  $x + y \leq 1$ ,  $3x + y \geq 3$   $x \geq 0$ ,  $y \geq 0$
  28. Find the logarithm of 2025 to the base  $3\sqrt{5}$ .
  29. Construct the truth table for " $p \rightarrow q$ ".
  30. What sum of money will yield ₹1407 as interest in  $1\frac{1}{2}$  year at 14% p. a. simple interest.

Section – B  
(Fundamentals of Business Statistics)

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

1. (Class frequency) / (Width of the class) is defined as
  - (a) Frequency density
  - (b) Frequency distribution
  - (c) Both
  - (d) None
2. 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
3. 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
4. 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
- (5) If the median of 5, 9, 11, 3, 4,  $x$ , 8 is 6, the value of  $x$  is equal to
  - (a) 6
  - (b) 5
  - (c) 4
  - (d) 3
- (6) In Ogive, abscissa corresponding to ordinate  $N/2$  is
  - (a) Median
  - (b) 1<sup>st</sup> quartile
  - (c) 3<sup>rd</sup> quartile
  - (d) None
- (7) If a card is drawn at random from a pack of 52 cards, what is the chance of getting a Spade or an ace?
  - (a)  $4/13$
  - (b)  $5/13$
  - (c) 0.25

## Answer to MTP\_Foundation\_Syllabus 2012\_Dec2017\_Set 2

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- (d) 0.20
- (8) A, B and C are three mutually exclusive and exhaustive events such that  $P(A)=2$   $P(B) = 3$   $P(C)$ . What is  $P(B)$ ?
- (a)  $6/11$   
(b)  $6/22$   
(c)  $1/6$   
(d)  $1/3$
- (9) If the coefficient of correlation between two variables is  $-0.2$ , then the coefficient of determination is
- (a) 0.4  
(b) 0.02  
(c) 0.04  
(d) 0.16
- (10) The sum of the difference of rank is
- a) 1  
b) -1  
c) 0  
d) None
- (11) The value of correlation coefficient lies between
- (a) -1 and +1  
(b) -1 and 0  
(c) 0 and 1  
(d) None
- (12) 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)  $1/4$

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

1. Given Mean = 50, C.V = 40%, Karl Pearson's Coefficient of Skewness = - 0.4. Find standard deviation and Mode
2. If  $\bar{X} = 56.2$  ,  $Z = 55$ ; Find M
3. If three dice are thrown simultaneously, then the probability of getting a score of 5 is
4. Calculate S.D. for first 10 natural nos.
5. 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.
6. In a Moderately Asymmetrical Distribution Compute M.D. and S.D. Given Q.D. = 50
7. If the first quartile is 104 and quartile deviation is 18. Find the third quartile.
8. A dice is rolled. What is the probability that a number 1 or 6 may appear on the upper face?
9. If the median of 5, 9, 11, 3, 4, x, 8 is 6. Find the value of x.

## Answer to MTP\_Foundation\_Syllabus 2012\_Dec2017\_Set 2

10. The probability that a number selected at random from the set of numbers  $\{1,2,3,\dots,100\}$  is a cube is:
11. In a Moderately Asymmetrical Distribution. Compute M.D. and Q.D. Given S.D. = 50
12. 4 coins are tossed. Find the probability that at least one head turns up.

X. Answer any FOUR of the following questions

[4 × 6 = 24]

1. Draw Pie diagram to represent the data

Item	Food	Rent	Clothing	Fuel	Education	Miscellanies
Expenditure	240	125	66	57	42	198

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. Compute rank correlation from the following table

X	415	434	420	430	424	428
Y	330	332	328	331	327	325

4. Find Quantity Index No. from following data i) Laspeyre's, ii) Paasche's iii) Dorbish and Bowley's

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

5. Fit a straight line trend to the following data and estimate the likely profit for the year 2012. Also calculate the trend values.

Year	2003	2004	2005	2006	2007	2008	2009
Profit (in lakhs of ₹)	60	72	75	65	80	85	95

6. What is the chance that a leap year, selected at random will contain 53 Sundays?