December 2019

P–4(FBMS)
Syllabus 2016

Fundamentals of Business Mathematics and Statistics

Time Allowed: 3 Hours

Full Marks: 100

The figures in the margin on the right side indicate full marks.
Notations and symbols used are as usual.

Section-A

(Fundamentals of Business Mathematics)

1. (a) Choose the correct answer: 2×9=18

   (i) Two numbers are in the ratio 5:7. If the sum of the numbers is 192, then the greater number is

      (A) 112

      (B) 102

      (C) 116

      (D) 108

   (ii) x varies inversely as y and if $x = 3$ then $y = 4$. If $y = 6$ then the value of x is

      (A) 3

      (B) 1

      (C) 2

      (D) 2·5

   (iii) A sum will be double itself at a simple interest p.a. in 8 years. The simple interest is

      (A) 10%

      (B) 10·5%

      (C) 12%

      (D) 12·5%

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(iv) If $(x - 1)$, $(x + 1)$ and $(2x + 3)$ are in A.P., then the value of x is

   (A) –2

   (B) 0

   (C) 2

   (D) 4

(v) The 8th term of the series 256, 128, 64, …. is

   (A) 2

   (B) 4

   (C) 8

   (D) 16

(vi) If $2^{x-1} + 2^{x+1} = 80$, then the value of x is

   (A) 8

   (B) 4

   (C) 5

   (D) 10

(vii) If a and b be the roots of the equation $2x^2 + 2x - 3 = 0$ then the value of $2ab$ is

   (A) –6

   (B) 3

   (C) 1

   (D) –3

(viii) The value of $^3P_3 - {}^3C_3$ is

   (A) 0

   (B) 5

   (C) 6

   (D) 1

  (ix) P and Q are two non-empty sets. Given :

$$n(P) = 12, \ n(Q) = 6 \text{ and } n(P \cup Q) = 10. \text{ The } n(P \cap Q) \text{ is}$$

    (A) 8

    (B) 9

    (C) 7

    (D) 0

2. State whether the following statements are *True* or *False*:   1×6=6

  (i) The mean proportional between 2 and 8 is 4.

  (ii) If $1 + 2 + 3 + \ldots\ldots + n = 231$ then the value of n is 21.

  (iii) $\log_a mn = (\log_a m)(\log_a n)$

  (iv) $\frac{1}{2}(^nP_3) = 3\ (^nC_3)$

  (v) If $3^x = \dfrac{1}{243}$ then the value of x is 5.

  (vi) The roots of the quadratic equation $2x^2 - 12x + 18 = 0$ are not equal.

3. Answer *any four* questions: 4×4=16

  (a) There are 25 members of a student council in a college and the ratio of the number of boys to the number of girls is 3 : 2. How many more boys should be added to the council so that the ratio of the number of boys to the number of girls is 9 : 5?

  (b) What sum of money will amount to ₹ 3704·40 in 3 years at 5% compound interest?

  (c) There are 5 questions in group A, 4 in group B and 3 in group C. In how many ways can you select 6 questions taking 3 from group A, 2 from group B and 1 from Group C?

  (d) If $P = \{2, 3, 4\}, Q = \{3, 4, 5\}, R = \{1, 2, 5, 6)$ then find the set $P \cup (Q \cap R)$.

  (e) Find the value of $\dfrac{1}{\log_2 24} + \dfrac{1}{\log_3 24} + \dfrac{1}{\log_4 24}$.

  (f) Find the value of $\left(\dfrac{1}{81}\right)^{-\frac{3}{4}} \times (243)^{-\frac{1}{5}}$

Section-B

(Fundamentals of Business Statistics)

4. Choose the correct answer: 2×12=24

(i) The necessary diagram to compare among the various components or between a part and the whole is

(A) Bar diagram

(B) Step diagram

(C) Pie diagram

(D) Histogram

(ii) A random variable X can take the values -1, 0 and 1 with respective probabilities 0·2, 0·5 and 0·3. The expected value of X is

(A) 0·3

(B) 0·5

(C) 0·2

(D) 0·1

(iii) Consider the following data:

Marks in Mathematics:	0 – 9	10 – 19	20 – 29	30 – 39	40 – 49	Total
No. of students (f):	10	8	12	15	5	50

Frequency density of the second class is

(A) 0·8

(B) 8

(C) 1·2

(D) 1

(iv) The measure of central tendency of a statistical data which takes into account all the data

(A) Median

(B) Mean

(C) Mode

(D) Range

(v) The A.M. of the numbers 1, 3, 5, …….., $(2n - 1)$ is

    (A) n^2

    (B) $n + 1$

    (C) n

    (D) $2n$

(vi) The Harmonic Mean (H.M.) of the series 1, 2, 4 is

    (A) 5

    (B) 7

    (C) $\frac{7}{5}$

    (D) $\frac{12}{7}$

(vii) For a symmetrical distribution first quartile and median are respectively 20 and 24. The third quartile of the distribution is

    (A) 28

    (B) 26

    (C) 22

    (D) 32

(viii) Standard Deviation (S.D.) for two observations 1 and 4 is

    (A) 1

    (B) 1·5

    (C) 2

    (D) 3

(ix) If the two regression coefficients are $b_{yx} = -0.4$ and $b_{xy} = -0.9$ then the value of correlation coefficient (r) is

    (A) 0·6

    (B) 0·65

    (C) –0·6

    (D) –0·65

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(x) For a frequency distribution coefficient of skewness = 0·6, mean = 172 and mode = 163. The value of the variance is

(A) 169

(B) 215

(C) 196

(D) 225

(xi) For two mutually exclusive events A and B if $P(A) = \frac{3}{4}$ and $P(B) = \frac{1}{6}$, then $P(A \text{ or } B)$ is

(A) $\frac{11}{12}$

(B) $\frac{5}{12}$

(C) $\frac{7}{8}$

(D) $\frac{1}{8}$

(xii) Two unbiased coins are tossed simultaneously. The problem of getting a head and a tail is

(A) $\frac{1}{4}$

(B) $\frac{1}{2}$

(C) 1

(D) $\frac{3}{4}$

5. State whether the following statements are *True* and *False*:   1×12=12

(i) Runs in a cricket match is a continuous variable.

(ii) Mode for a frequency distribution is calculated from Histogram.

(iii) The sum of the deviations of $x_1, x_2, ..., x_n$ from their A.M. $\bar{x}$ is zero.

(iv) Variance is always positive.

(v) A variable x takes the values 10 and 20 with equal frequencies then the mean of x is 30.

(vi) Median divides the whole statistical data into two equal parts.

(vii) The standard deviation (S.D.) is independent of change of origin but dependent on scale.

(viii) 50th percentile is known as 2nd quartile.

(ix) For a negatively skewed distribution it is found that mean, median and mode are respectively 58, 54 and 48.

(x) The correlation coefficient between two variables is independent of change of origin as well as change of scale.

(xi) If two events A and B are mutually exclusive then $P(A \cap B) = P(A)P(B)$.

(xii) The coefficient of range is calculated as

$$\frac{\text{Maximum observation} - \text{Minimum observation}}{\text{Maximum observation} + \text{Minimum observation}} \times 100$$

6. Answer *any four* questions: 6×4=24

(a) The following data relating to marks in a test on Mathematics of 50 students in a school were noted below:

48	54	65	58	55	57	65	55	43	60
54	65	56	77	53	63	34	45	58	47
43	42	40	56	64	63	48	75	34	53
58	53	35	33	48	46	54	44	52	62
57	56	59	55	37	42	72	47	48	46

Arrange the data in the form of a frequency distribution table in 5 classes (31 – 40, 41 – 50, 51 – 60, 61 – 70, 71 – 80). Prepare a table for cumulative frequencies (both less than and more than types) and relative frequencies.

(b) Compute the mean and standard deviation from the following data:

Marks in Mathematics:	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of students:	5	7	28	9	1

(c) Show that the standard deviation is greater than mean deviation from mean for the observations 3, 4, 5, 8.

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(d) The ranks of 6 students in Mathematics (R_1) and Economics (R_2) are given as

R_1	6	2	5	1	4	3
R_2	4	3	2	5	1	6

Calculate the rank correlation coefficient.

(e) You are given the following data:

	x	y
A.M.	20	25
S.D.	5	4

Correlation coefficient between x and y is 0·6. Find the two regression equations.

(f) The probability that A speaks truth is 0·4 and B speaks truth is 0·6. What is the probability that they will contradict each other in stating the same fact?

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