FOUNDATION COURSE EXAMINATION

December 2016

P–4(FBMS)
Syllabus 2012

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

1. Answer *any two* questions: 5×2=10

(a) A sum of money invested at compound interest amounts to ₹ 10,816 at the end of second year and to ₹ 11,248·64 at the end of third year; find the rate of interest.

(b) What is the true discount (TD) of ₹ 425 due in 15 months hence at 5% simple interest p.a.?

(c) Two numbers are in the ratio of 2 : 7 and if 9 be added to each of them, the sums become in the ratio 1 : 2. Find the numbers.

2. Answer *any two* questions: 3×2=6

(a) A man deposits ₹ 10,000 at the end of each year in a bank which pays 5% p.a. compound interest. If the installments are allowed to accumulate, what will be the total accumulation at the end of 10 years? (Given $(1{\cdot}05)^{10} = 1{\cdot}62889$ (approximately)).

(b) Find x if

$$\begin{vmatrix} 4 & -3 \\ x & 2 \end{vmatrix} + \begin{vmatrix} \frac{1}{3} & -\frac{1}{2} \\ 6 & 6 \end{vmatrix}^2 = \begin{vmatrix} 7 & -9 \\ 1 & 6 \end{vmatrix}.$$

(c) Find the ratio of ${}^5P_2 : {}^5C_2$.

3. Choose the correct answer: 1×5=5

(a) If $\frac{x}{2} = \frac{y}{3}$, then $x : y$ is equal to

(i) 3 : 2 (ii) 2 : 3 (iii) 5 : 6 (iv) 6 : 5

(b) If $x \propto y$ and when $x = 5, y = 5$ then the value of x when $y = 10$ is

(i) 100 (ii) 0 (iii) 1 (iv) 10

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(c) If $2^x + \frac{1}{2^x} = \frac{5}{2}$, the value of x is

(i) -1 (ii) ± 1 (iii) 0 (iv) 1

(d) A and B are two non-empty sets and $n(A) = 10, n(B) = 6$ and $n(A \cap B) = 2$, then the value of $n(A \cup B)$ is

(i) 16 (ii) 12 (iii) 14 (iv) 18

(e) If $\int_1^k x^2 dx = 21$, the value of k is

(i) 3 (ii) 2 (iii) 4 (iv) 6

4. Fill in the blanks: 1×5=5

(a) Logarithm of unity to any non-zero base is _____.

(b) The value of $\int_0^1 e^{2\log x} dx$ is _____.

(c) $lim_{x\to\infty} \frac{6-5x^2}{4x+15x^2}$ = _____.

(d) If $y = e^{mx}$ and $\frac{dy}{dx} = 3$ when $x = 0$, then the value of m is _____.

(e) The product of the roots of the quadratic equation $2x^2 + 5x + 2 = 0$ is _____.

5. State whether the following statements are true (T) or false (F): 1×5=5

(a) Let A be a matrix of order 3×4 and B be a matrix of order 4×5 then their product AB is a matrix of order 3×5.

(b) Given $log_{10}1372 = 3{\cdot}1374$. The mantissa for log_{10} 13·72 is 0·1374.

(c) The value of 0! is 0.

(d) $\begin{bmatrix} 6 & -4 \\ 3 & -2 \end{bmatrix}$ is a singular matrix.

(e) The domain of the function $f(x) = \log(x^2 - 3x + 2)$ is $1 < x < 2$.

6. Match the following: 1×5=5

(a) Number of ways 7 boys can form a ring is	(i)	−27
(b) If $\begin{bmatrix} 2 & -3 \\ -4 & 1 \end{bmatrix} = \begin{bmatrix} -2 & 5 \\ 0 & -1 \end{bmatrix} + k\begin{bmatrix} 2 & -4 \\ -2 & 1 \end{bmatrix}$, the value of k is	(ii)	9
(c) A varies inversely with B and $B = 3$ when $A = 7$. Then if $B = 7/3$, A is	(iii)	720
(d) If $n(A \cap B^c) = 20$ and $n(A \cap B) = 12$, then the value of $n(A)$ is	(iv)	2
(e) The minimum value of the function $f(x) = 3x^2 - 18x$ is	(v)	32

7. Answer the following in one or two steps: 1×4=4

(a) Show that $p \vee \sim(p \wedge q)$ is a tautology.

(b) If $x = 2t$ and $y = t^2$ find dy/dx.

(c) Evaluate the determinant: $\begin{vmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 1 & 1 & 1 \end{vmatrix}$.

(d) A sum of ₹ 10,000 is invested for simple interest at the rate of 10% per annum for 3 years. Find the amount received as interest after 3 years.

Section B

8. Choose the correct answer (*any nine*): 2×9=18

(a) When class intervals (C.I) are unequal histogram is drawn using

(i) frequency

(ii) frequency density

(iii) relative frequency

(iv) cumulative frequency

(b) Line chart is also called

(i) simple bar chart

(ii) histogram

(iii) multiple bar diagram

(iv) ratio chart

(c) The vertical axis of an ogive shows

(i) cumulative frequency

(ii) absolute frequency

(iii) frequency density

(iv) class boundary

(d) The angle in a pie diagram for the expenditure on food is 144 degree only. The percentage of expenditure on other items is

(i) 70

(ii) 60

(iii) 50

(iv) 40

(e) Which one of the following is the value of GM of two observations when AM = 27 and HM = 3?

(i) 7

(ii) 11

(iii) 9

(iv) 12

(f) What is the median of first twelve natural numbers?

(i) 6

(ii) 6·5

(iii) 5·5

(iv) 7

(g) The mean of 5 observations is 10. The sum of deviations from mean of first 4 observations is 4. What is the fifth observation?

(i) 10

(ii) 6

(iii) 4

(iv) 8

(h) The correlation coefficient between x and y is 0·8. The correlation coefficient between $x+2$ and $y-2$ is

(i) 0·6

(ii) 0·8

(iii) 1

(iv) 0·4

(i) If A, B and C are three mutually exclusive and exhaustive events with $P(A) = 0{\cdot}6$ and $P(B) = 0{\cdot}2$ then $P(C)$ is

(i) 0·1

(ii) 0·9

(iii) 0·2

(iv) 0·4

(j) Probability of getting a sum of 8 points by throwing 2 unbiased dice is

(i) $^1/_4$

(ii) $^1/_8$

(iii) $^1/_{12}$

(iv) $^5/_{36}$

(k) Laspeyre Price Index Number and Paasche Price Index Number are 130 and 140 respectively. The Fisher's Price Index Number is

(i) 135

(ii) 182

(iii) 134·9

(iv) 164·3

9. Answer *any nine* questions: 2×9=18

(a) If the mean of $2x - 10$ is 50, find the mean of $4x + 5$.

(b) The weights of five students are 45, $x - 5$, 48, $x + 3$ and 42 and the arithmetic mean of weights is 47. Find the median of the observations.

(c) Calculate the geometric mean of 0·1, 0·01, and 0·001.

(d) If $n = 10$, $\sum x = 125$, $\sum y = 140$ and $\sum xy = 485$, find the covariance of x and y.

(e) If $b_{yx} = 10$ and $\sigma_y = 10\sigma_x$, find b_{xy}.

(f) For a Poisson variable X if $P(X=0) = P(X = 1)$, find $P(X > 0)$.

(g) For a standard normal variable z if $P\{0 \leq z \leq 0{\cdot}83\} = 0{\cdot}2967$ and $P\{0 \leq z \leq 1{\cdot}37\} = 0{\cdot}4147$ find $P\{-0{\cdot}83 \leq z \leq 1{\cdot}37\}$.

(h) Given $\sum P_1Q_0 = 309, \sum P_0Q_0 = 256, \sum P_1Q_1 = 283, \sum P_0Q_1 = 242$. Find the Marshall-Edgeworth price index number.

(i) A price index number P satisfies the time reversal test. If $P_{01} = 150$ find P_{10}.

(j) Let I denote the Group Index and w be the Group Weight. Given $\sum Iw = 32158$ and $\sum w = 100$, find the Cost of Living Index Number.

(k) The sales figures (₹ in lakhs) of 6 consecutive years are: 16·2, 17·5, 18·7, 20·2, 19·6 and 17·2. Find the 5-term moving averages.

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

(a)

Class Boundaries (CB) :	10 – 20	20 – 30	30 – 40	40 – 50	Total
Frequency (f):	14	f_2	45	f_4	100

Find f_2 and f_4 when first quartile $(Q_1) = 25$.

(b) For a batch of 10 boys, the mean and standard deviation of weights are found to be 50kg and 5kg respectively. On further verification it is detected that the weights of two boys have been wrongly included as 45 kg and 55 kg instead of the actual values 42 kg and 48 kg. Calculate the correct mean and correct standard deviation.

(c) The examination scores of five students in Mathematics (x) and in Statistics (y) are given below:

x :	10	6	5	1	3
y :	4	5	8	3	7

Find Spearman's rank correlation coefficient between x and y.

(d) A certain carton of eggs has 2 bad and 10 good eggs. If a cake is made of 4 eggs randomly chosen from the carton, what is the probability that the cake contains

(i) no bad egg,

(ii) at least one bad egg, and

(iii) exactly 2 bad eggs?

(e) Fitting a linear trend to the following data, estimate the sales (in' 0000 ₹) for the year 2016.

Years:	2009	2010	2011	2012	2013	2014
Sales:	15	18	20	25	28	30