Lahore Board 2023

Objective Type

Roll No. ___ (To be filled in by the candidate) (Academic Sessions 2019 - 2021 & 2022 - 2024)

Business Mathematics 223 - 1st Annual - (Inter Part - I) Time : 20 Minutes

Q. Paper Paper Code = 6648 Maximum Marks: 10

NOTE: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answers book. Cutting or filling two or more circles will result in zero mark in that question.

Q1.

1	**The term "function" was introduced by:**			
	(A) Newton	(B) Cauchy	(C) Leibniz	(D) Lagrange
2	**The number '4' in a binary system is:**			
	(A) $(101)_2$	(B) $(100)_2$	(C) $(111)_2$	(D) $(1010)_2$
3	**The order of a matrix [1 3 5] is :**			
	(A) 1×1	(B) 2×2	(C) 3×1	(D) 1×3
4	**160 if 20% of what number:**			
	(A) 800	(B) 8000	(C) 80	(D) 80000
5	**Ratio between 10 minutes and 30 minutes is:**			
	(A) 2 : 3	(B) 1 : 3	(C) 2 : 4	(D) 1 : 5
6	**Simple interest on Rs. 400 @ 9% annually in 2 years is:**			
	(A) 36	(B) 360	(C) 72	(D) 720
7	**The determinant of an identity matrix is equal to:**			
	(A) 0	(B) 1	(C) –1	(D) 2
8	**In a binary system, digits used:**			
	(A) (1, 2)	(B) (0, 2)	(C) (0, 1)	(D) (1, 10)
9	**Solution set of $x^2 + x - 12 = 0$ is:**			
	(A) {3, –4}	(B) {–3, 4}	(C) {3, 4}	(D) {–3, –4}
10	**Degree of linear equation is:**			
	(A) One	(B) Two	(C) Three	(D) Four

Answers:

1. C	2. B	3. D	4. A	5. B	6. C	7. B	8. C	9. A	10. A

Subjective Type

Roll No. _____ (To be filled in by the candidate) (Academic Sessions 2019 - 2021 & 2022 - 2024)

BUSINESS MATHEMATICS 223 - 1st - (INTER PART - I) Time Allowed: 1:45 hours

Paper - I (Essay Type) (SECTION - I) Maximum Marks: 40

Q2. Write short answers to any SIX (6) questions: 12

(i) Divide Rs. 7500 in ratio 3 : 2.

Sol. Given ratio = 3 : 2

Sum of ratio = 3 + 2 = 5

$$\text{1st share} = \frac{3}{5} \times 7500 = 1500 \times 3 = 4500$$

$$\text{2nd share} = \frac{2}{5} \times 7500 = 1500 \times 2 = 3000$$

(ii) Find the mean proportional between 4 and 9.

Sol. Let x be the mean proportional.

Then 4 : x : : x : 9

product of mean = product of extreme

$x^2 = 36$

$x = \pm 6$

(iii) A chair that costs Rs. 190 is sold for Rs. 250. Find the percentage of profit.

Sol.

$$\text{Cost} = 190$$
$$\text{Selling price} = 250$$
$$\text{Profit} = \text{Selling price} - \text{cost price}$$
$$= 250 - 190 = 60$$
$$\text{Profit percentage} = \left(\frac{\text{Profit}}{\text{Cost}} \times 100\right)\% = \left(\frac{60}{190} \times 100\right)\% = 31.57\%$$

(iv) Find the simple interest on Rs. 80000 invested for three years at 9% per annum.

Sol.

$$\text{Principal amount} = P = 80000$$
$$\text{Interest rate} = I = 9\% = 0.09$$
$$\text{Number of years} = N = 3$$
$$\text{Simple interest (S.I)} = PIN = (80000)(0.09)(3)$$
$$S.I = 21600$$

(v) Define annuity due.

Ans. An annuity is considered as to be annuity due if every payment is made at the beginning of each payment period and continue for a definite period. This annuity is also called beginning mode annuity.

(vi) Solve $\frac{3x}{8} + 5 = 17$

Sol.

$$\frac{3x}{8} + 5 = 17 \Rightarrow \frac{3x}{8} = 17 - 5 \Rightarrow \frac{3x}{8} = 12$$

$$3x = 12 \times 8 \Rightarrow 3x = 96 \Rightarrow x = \frac{96}{3} = 32$$

(vii) Solve $3x + 2 = 2x + 6$

Sol.

$$3x + 2 = 2x + 6$$
$$3x - 2x = 6 - 2 \Rightarrow x = 2$$

(viii) Solve by factorization $x^2 + 9x + 18 = 0$

Sol.

$$x^2 + 9x + 18 = 0$$
$$x^2 + 6x + 3x + 18 = 0$$
$$x(x + 6) + 3(x + 6) = 0$$
$$(x + 6)(x + 3) = 0$$
$$x + 6 = 0 \quad ; \quad x + 3 = 0$$
$$x = -6 \quad ; \quad x = -3$$

$S.S = \{-6, -3\}$

(ix) Solve by completing square method $x^2 - 9x + 4 = 0$

Sol.

$$x^2 - 9x + 4 = 0$$
$$x^2 - 9x = -4$$

Adding $\left(\frac{9}{2}\right)^2$ on b.s

$$x^2 - 9x + \left(\frac{9}{2}\right)^2 = -4 + \left(\frac{9}{2}\right)^2$$
$$\left(x - \frac{9}{2}\right)^2 = -4 + \frac{81}{4} = \frac{-16 + 81}{4} = \frac{65}{4}$$
$$x - \frac{9}{2} = \pm\sqrt{\frac{65}{4}} = \pm\frac{\sqrt{65}}{2}$$
$$x = \frac{9}{2} - \frac{\sqrt{65}}{2}$$

Q3 Write short answers to any SIX (6) questions: 12

(i) If $f(x) = x^2 - 5x + 6$, find $f(1)$, $f(0)$

Sol.

$$f(x) = x^2 - 5x + 6$$

Put $x = 1$ $\quad f(1) = (1)^2 - 5(1) + 6 = 1 - 5 + 6 = 7 - 5 = 2$

Put $x = 0$ $\quad f(0) = (0)^2 - 5(0) + 6 = 6$

(ii) Find the slope and y-intercept of the equation $y = \frac{3}{2}x + 2$

Sol.

$$y = \frac{3}{2}x + 2 \quad \text{(i)}$$

We know that

$$y = mx + c \quad \text{(ii)}$$

By comparing (i) and (ii)

$$m = \frac{3}{2}$$

$$\text{slope} = m = \frac{3}{2}$$

y–intercept

Put $x = 0$ in $y = \frac{3}{2}x + 2$

$$y = \frac{3}{2}(0) + 2 = 2 \Rightarrow (x, y) = (0, 2)$$

(iii) Convert $(23)_{10}$ into binary number system.

Sol.

2	23
2	11 – 1
2	5 – 1
2	2 – 1
	1 – 0

$23 = (10111)_2$

(iv) Convert $(10011)_2$ into decimal system.

Sol. $(10011)_2$

$= 1 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

$= 1 \times 16 + 0 + 0 + 1 \times 2 + 1 \times 1 = 16 + 2 + 1 = 19$

(v) Evaluate $(1101)_2 - (11)_2$

Sol.

$$\begin{array}{r} (1\ \ 1\ \ 0\ \ 1)_2 \\ -(\ \ \ \ 1\ \ 1)_2 \\ \hline 1\ \ 0\ \ 1\ \ 0 \end{array}$$

$(1010)_2$

(vi) Define transpose of a matrix.

Ans. Let $A = [a_{ij}]$ be an $m \times n$ matrix. The transpose of A, written as A^t, is defined as to be the matrix $[a_{ij}]$ $n \times m$.

(vii) Find AB if $A = \begin{bmatrix} 2 & 1 \\ 3 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

Sol. $A = \begin{bmatrix} 2 & 1 \\ 3 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

$$AB = \begin{bmatrix} 2 & 1 \\ 3 & 1 \end{bmatrix}\begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 2\times2+1\times1 \\ 3\times2+1\times1 \end{bmatrix} = \begin{bmatrix} 4+1 \\ 6+1 \end{bmatrix} = \begin{bmatrix} 5 \\ 7 \end{bmatrix}$$

(viii) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 3 \\ 5 & 2 \end{bmatrix}$, then find $2A + 3B$.

Sol.

$$2A = 2\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$$

$$3B = 3\begin{bmatrix} 4 & 3 \\ 5 & 2 \end{bmatrix} = \begin{bmatrix} 12 & 9 \\ 15 & 6 \end{bmatrix}$$

$$2A + 3B = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix} + \begin{bmatrix} 12 & 9 \\ 15 & 6 \end{bmatrix} = \begin{bmatrix} 2+12 & 4+9 \\ 6+15 & 8+6 \end{bmatrix} = \begin{bmatrix} 14 & 13 \\ 21 & 14 \end{bmatrix}$$

(ix) Find the value of x when $A=\begin{bmatrix} 2x & -4 \\ -1 & 5 \end{bmatrix}$ and $|A| = 16$.

Sol.

$$A = \begin{bmatrix} 2x & -4 \\ -1 & 5 \end{bmatrix}$$

As

$$|A| = 16$$

$$\begin{vmatrix} 2x & -4 \\ -1 & 5 \end{vmatrix} = 16$$

$$(2x)(5) - (-4)(-1) = 16$$

$$10x - 4 = 16$$

$$10x = 16 + 4$$

$$10x = 20$$

$$x = 2$$

(SECTION - II)

Note: Attempt any TWO questions. **$2 \times 8 = 16$**

Q4. (a) 16 men complete a job in 10 days. How long would it take 32 men to complete the same job? 4

Sol. Place the given information in the form of a table.

Men		Days
↓ 16	:	↑ 10
↓ 32	:	↑ x(say)

It is a inverse proportion because increase of men, will decrease the days. So,

$$16 : 32 :: x : 10$$

Product of means = Product of extremes

$(32)(x) = (16)(10)$

$32x = 160$

$x = 5$

Thus the required days are 5.

(b) Find the compound amount at the end of one year if Rs. 2000 are invested at 10% interest compounded annually. 4

Sol. P = Rs. 2000

i = 10% Compound annually

$= \frac{10}{100} = 0.1$ Compound annually

n = 1 year

As $A = p(1+i)^n$

$= 2000(1 + 0.1)^1$

$= 2000(1.1)$

$A = 2200$

Q5. (a) A firm sells a single product as Rs.65 per unit and variable cost is Rs.47.50 and fixed cost is Rs.10000. Find the profit function in terms of 'x' No. of units produced and sold. 4

Sol. Revenue function $(R(x)) = 65x$

Cost function $(C(x))$ = Fixed cost + Variable cost

$= 10000 + 47.5x$

As Profit function $(P(x)) = R(x) - C(x)$

$P(x) = 65x - (10000 + 47.5x)$

$= 65x - 10000 - 47.5x$

$P(x) = 17.5x - 10000$

(b) Find the value of x if $\frac{x+2}{x-3}+\frac{x-3}{x+2}=\frac{5}{2}$ **4**

Sol. $\frac{x+2}{x-3}+\frac{x-3}{x+2}=\frac{5}{2}$

$$\frac{(x+2)^2+(x-3)^2}{(x-3)(x+2)}=\frac{5}{2}$$

$$\frac{x^2+4x+4+x^2-6x+9}{x^2+2x-3x-6}=\frac{5}{2}$$

$$\frac{2x^2-2x+13}{x^2-x-6}=\frac{5}{2}$$

Tacking cros multiplication

$(2x^2-2x+13)(2) = (5)(x^2-x-6)$

$4x^2-4x+26 = 5x^2-5x-30$

$4x^2-5x^2-4x+5x+26+30=0$

$-x^2+x+56=0$

$x^2-x-56=0$

By the method of factorization

$x-8x+7x-56=0$

$x(x-8)+7(x-8)=0$

$(x-8)(x+7)=0$

$x-8=0 \quad : \quad x+7=0$

$x=8 \quad : \quad x=-7$

S.S = {–7, 8}

06 (a) Solve the Crammer's rule $x+y=10$, $x-y=2$ **4**

Sol. The given system of linear equations is

$x+y=10$

$x-y=2$

The matrix formis

$$\begin{bmatrix}1 & 1\\ 1 & -1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}10\\ 2\end{bmatrix}$$

Let AX = B

Here $A=\begin{bmatrix}1 & 1\\ 1 & -1\end{bmatrix}, B=\begin{bmatrix}10\\ 2\end{bmatrix}, X=\begin{bmatrix}x\\ y\end{bmatrix}$

Then accoridng to cramer rule

$$x=\frac{|A_x|}{|A|}=\frac{\begin{vmatrix}10 & 1\\ 2 & -1\end{vmatrix}}{\begin{vmatrix}1 & 1\\ 1 & -1\end{vmatrix}}=\frac{-10-2}{-1-1}$$

$$=\frac{-12}{-2}=6$$

$$y=\frac{|A_y|}{|A|}=\frac{\begin{vmatrix}1 & 10\\ 1 & 2\end{vmatrix}}{\begin{vmatrix}1 & 1\\ 1 & -1\end{vmatrix}}=\frac{2-10}{-1-1}=\frac{-8}{-2}=4$$

(b) Simplify: $\{(100111)_2+(10101)_2\}-(10111)_2$ **4**

Sol. $\{(100111)_2+(10101)_2\}-(10111)_2$

$=(111100)_2-(10111)_2$

$=(100101)_2$

$$\begin{array}{r} (1\ 0\ 0^1\ 1^1\ 1^1\ 1)_2 \\ +\ (1\ 0\ 1\ 0\ 1)_2 \\ \hline (1\ 1\ 1\ 1\ 0\ 0)_2 \end{array} \qquad \begin{array}{r} (1\ 1\ 1\ 1\ 0\ 0)_2 \\ -\ (1\ 0\ 1\ 1\ 1)_2 \\ \hline (1\ 0\ 0\ 1\ 0\ 1)_2 \end{array}$$