Faisalabad Board 2024

Objective Type

Intermediate Part First Roll No. _____

Paper Code 6641

BUSINESS MATHEMATICS

Time: 15 Minutes Marks: 10

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many question as given in objective types question paper and leave other circle blank.

Q1

Sr.	Questions	(A)	(B)	(C)	(D)
1	The simplest form of ratio $\frac{4}{9}$ to $\frac{1}{3}$:	4 to 1	1 to 3	3 to 1	4 to 3
2	In 10 : x : : 8 : 4 , x is equal to:	5	6	4	2
3	The simple interest on Rs. 4800 for 2 years at 6% per annum is:	476	576	676	657
4	If $G(x) = x^2 + 4$ then $G(\sqrt{3})$ is:	1	–1	7	–7
5	If $\frac{3x}{8} + 5 = 17$ then = ?	x = 32	x = 23	x = 34	x = 43
6	$x^2 - 8 + 15 = 0$ can be factorize as:	(x + 5)(x – 3)	(x – 5)(x + 3)	(x – 5)(x – 3)	(x + 5)(x + 3)
7	8 in binary system is:	$(10)_2$	$(100)_2$	$(1011)_2$	$(1000)_2$
8	$(1101)_2 + (110)_2$ = ____.	$(11001)_2$	$(10011)_2$	$(10101)_2$	$(10001)_2$
9	A square matrix A is said to be singular if:	$\|A\| = 0$	$\|A\| \neq 0$	$\|A\| = 1$	$\|A\| < 1$
10	If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ then A + B is equal to:	$\begin{bmatrix} -1 & -1 \\ -1 & -1 \end{bmatrix}$	$\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$	$\begin{bmatrix} 3 & 5 \\ 7 & 9 \end{bmatrix}$	$\begin{bmatrix} 2 & 8 \\ 6 & 3 \end{bmatrix}$

Answers:

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

Subjective Type

Intermediate Part First Roll No. _____

BUSINESS MATHEMATICS

Time 01:45 Hours Marks: 40

SECTION - I

Q2 Write short answers to any SIX parts. 12

(i) **If a pole of height 20 feet cast a shadow 24 feet, how long a shadow would be for pole of height 30 feet?**

Sol. Place the given value in the form of table.

Height	Shadow
20	24
30	x(say)

By proportion $20 : 30 : : 24 : x$

Product of extremes = Product of means

$(20)(x) = (30)(24)$

$20x = (720) \Rightarrow x = 36$

So, the shadow of a pole of height 30 feet would be 36 feet long.

(ii) **Express in reduced form 24 : 48**

Sol.
$$24 : 48$$
$$= 3 : 6$$
$$= 1 : 2$$

(iii) **Zahid has Rs. 500000 at the end of a year, what is the amount of Zakat?**

Sol. Given

Total wealth at the end of the year Rs. 500,000

Zakat rate : 2.5%

By using the formula

$$\text{Zakat} = \frac{\text{zakat rate}}{100} \times \text{Total wealth}$$
$$= \frac{205}{100} \times 500,000 = 12500$$

(iv) **How long will it take for Rs. 5000 to earn simple interest as Rs. 1000 invested at 10% per annum?**

Sol.
$$P = \text{Rs. } 5000$$
$$S.I = \text{Rs. } 1000$$
$$I = 10\% = 0.1 \text{ per annum}$$
$$N = ?$$

As we know

$$\text{Simple interest} = S.I = PIN$$
$$1000 = (5000)(0.1)(N)$$
$$N = \frac{100}{5000 \times 0.1}$$
$$N = 2 \text{ years}$$

(v) **The price of shoes was Rs. 350, which is 30% less of the actual price. Find the original price.**

Sol. We are given

Discount Rate = $DR = 30\% = 0.30$

Discount Price = $DP = 350$

Actual value = Stated Price = $SP = ?$

As we know

$$DP = SP(1 - DR)$$
$$350 = SP(1 - 0.30)$$
$$\Rightarrow SP = \frac{350}{1 - 0.30} = \frac{350}{0.7} = 500$$

Hence the shoes actual price is 500.

(vi) **Find the two consecutive integers whose sum is 99.**

Sol. Let x and x + 1 be two consecutive numbers then according to given condition.

$$x + (x + 1) = 99$$
$$x + x + 1 = 99$$
$$2x + 1 = 99$$
$$2x = 99 - 1 = 98$$
$$x = 49$$
$$\Rightarrow x + 1 = 49 + 1 = 50$$

So the two consecutive numbers are 49 and 50.

(vii) **Find x if : $100 - 7[3x - 3(4 - 3)] = x$**

Sol.
$$100 - 7[3x - 3(4 - 3)] = x$$
$$100 - 7[3x - 12 + 9] = x$$
$$100 - 7[3x - 3] = x$$
$$100 - 21x + 21 = x$$
$$100 + 21 = x + 21x$$
$$121 = 22x$$
$$x = \frac{121}{22} = \frac{11}{2}$$

(viii) **Reduce $x^4 - 10x^2 + 9 = 0$ into quadric form.**

Sol.

$$x^4 - 10x^2 + 9 = 0$$

Let $x^2 = y$

$\Rightarrow (x^2)^2 = y^2$

$x^4 = y^2$

$\Rightarrow$ So $y^2 - 10y + 9 = 0$

(ix) **Solve $y^2 - 10y + 9 = 0$ by factorization.**

Sol.

$$y^2 - 10y + 9 = 0$$

Here $y^2 - 9y - y + 9 = 0$

$y(y-9) - 1(y-9) = 0$

$(y-9)(y-1) = 0$

$y - 9 = 0 \quad : \quad y - 1 = 0$

$y = 9 \quad : \quad y = 1$

Q3. Write short answers to any SIX parts.

(i) **If $f(x) = x^2 - \frac{1}{x^2} + 3$; then find $f(\sqrt{2})$**

Sol.

$$f(x) = x^2 - \frac{1}{x^2} + 3$$

put $x = \sqrt{2}$

$$f(\sqrt{2}) = (\sqrt{2}) - \frac{1}{(\sqrt{2})^2} + 3$$

$$= 2 - \frac{1}{2} + 3$$

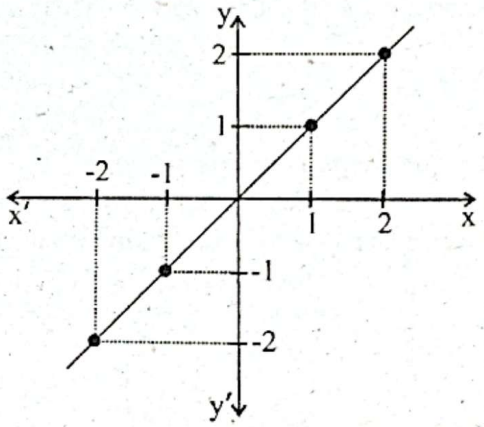
$$= \frac{4 - 1 + 6}{2}$$

$$f(\sqrt{2}) = \frac{9}{2}$$

(ii) **Draw the graph of the function $f(x) = x$**

Sol.

x	y
-2	-2
-1	-1
0	0
1	1
2	2



(iii) **Convert $(99)_{10}$ to binary system.**

Sol.

2	99		
2	49	–	1
2	24	–	1
2	12	–	0
2	6	–	0
2	3	–	0
	1	–	1

So, $(99)_{10} = (1100011)_2$

(iv) **Convert $(10100)_2$ into decimal system.**

Sol. $(10100)_2 = 1\times 2^4 + 0\times 2^3 + 1\times 2^2 + 0\times 2^1 + 0\times 2^0$

$= 1\times 16 + 0\times 8 + 1\times 4 + 0\times 2 + 0\times 1 = 16 + 0 + 4 + 0 + 0$

$(10100)_2 = (20)_{10}$

(v) **Simplify $(10000)_2 - (1011)_2$**

Sol.

$$\begin{array}{r} (10000)_2 \\ -\quad (1011)_2 \\ \hline (00101)_2 \end{array}$$

(vi) **Find value of λ if $A = \begin{bmatrix} \lambda & 4 \\ -2 & 2 \end{bmatrix}$ is singular.**

Sol. $A = \begin{bmatrix} \lambda & 4 \\ -2 & 2 \end{bmatrix}$

If A is singular

So $|A| = 0 \Rightarrow \begin{vmatrix} \lambda & 4 \\ -2 & 2 \end{vmatrix} = 0$

$2\lambda + 8 = 0$

$2\lambda = -8$

$\lambda = -4$

(vii) **Find A^{-1}, if $A = \begin{bmatrix} 5 & 3 \\ 4 & 2 \end{bmatrix}$**

Sol. $A = \begin{bmatrix} 5 & 3 \\ 4 & 2 \end{bmatrix}$

As $A^{-1} = \frac{1}{|A|}\text{Adj}A$ _____(i)

$|A| = \begin{bmatrix} 5 & 3 \\ 4 & 2 \end{bmatrix} = 10 - 12 = -2$

$\text{Adj } A = \begin{bmatrix} 2 & -3 \\ -4 & 5 \end{bmatrix}$

$\Rightarrow$ (i) becomes

$$A^{-1} = \frac{1}{-2}\begin{bmatrix} 2 & -3 \\ -4 & 5 \end{bmatrix} = \begin{bmatrix} \frac{2}{-2} & \frac{-3}{-2} \\ \frac{-4}{-2} & \frac{5}{-2} \end{bmatrix} = \begin{bmatrix} -1 & \frac{3}{2} \\ 2 & \frac{-5}{2} \end{bmatrix}$$

$$A^{-1} = \begin{bmatrix} -1 & \frac{3}{2} \\ 2 & \frac{-5}{2} \end{bmatrix}$$

(viii) **If $A = \begin{bmatrix} 1 & -2 \\ 3 & -4 \end{bmatrix}$; then compute A^2**

Sol. $A = \begin{bmatrix} 1 & -2 \\ 3 & -4 \end{bmatrix}$

$A^2 = A.A$

$= \begin{bmatrix} 1 & -2 \\ 3 & -4 \end{bmatrix}\begin{bmatrix} 1 & -2 \\ 3 & -4 \end{bmatrix} = \begin{bmatrix} 1-6 & -2+8 \\ 3-12 & -6+16 \end{bmatrix}$

$A^2 = \begin{bmatrix} -5 & 6 \\ -9 & 10 \end{bmatrix}$

(ix) Define non-singular matrix.

Ans. A square matrix A is said to be non-singular, if $|A| \neq 0$.

Example: $\begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix} \Rightarrow |A| = \begin{vmatrix} 1 & 3 \\ 2 & 1 \end{vmatrix} = 1 - 6 = -5 \neq 0$

SECTION - II

Note: Attempt any TWO questions. Each question carries 08 mark. $2 \times 8 = 16$

Q4. (a) A train travels 144 km distance is 2 hours. What will be travel in 50 minutes with same?

Sol. In 2 – hours distance travel = 144 km

$$\text{In 1 – hours distance travel} = \frac{144}{2}$$

$$= 72\text{km}$$

To calculate distance for 50 minutes first we convert 50 minutes to hours:

$$50 \text{ minutes} = \frac{50}{60} \text{ hours}$$

$$= \frac{5}{6} \text{ hours}$$

$$\text{Now 50 minutes distance} = 72 \times \frac{5}{6}$$

$$= 60\text{km}$$

So, in 50 minutes train will cover a 60km distance.

(b) Calculate the compound interest earned for Rs. 5000 invested for 6 years at 7% per annum.

Sol. Given Principal = P = 5000

Interest Rate = i = 7% per annum

= 0.07 per annum

n = 6 years

As Compound Amount = A $= P(1 + i)^n$

$= 5000\ (1+0.07)^6$

$= 5000\ (1.5007)$

$= 7503.65$

Compound Interest = C.I $= A - P$

$= 7503.65 - 5000$

C.I $= 2503.65$

Q5. (a) If f(t) = 6t + 4. Find $f\left(\frac{-1}{2}\right), f\left(\frac{1}{2}\right), f\left(\frac{3}{2}\right)$, f(–4)

Sol. $f(t) = 6t + 4$ ____(i)

put $t = \frac{-1}{2}$

$$f\left(\frac{-1}{2}\right) = 6\left(\frac{-1}{2}\right) + 4 = -3 + 4 = 1$$

put $t = \frac{1}{2}$

$$f\left(\frac{1}{2}\right) = 6\left(\frac{1}{2}\right) + 4 = 3 + 4 = 7$$

put $t = \frac{3}{2}$

$$f\left(\frac{3}{2}\right) = 6\left(\frac{3}{2}\right) + 4 = 3(3) + 4 = 9 + 4 = 13$$

put $t = -4$

$f(-4) = 6(-4) + 4 = -24 + 4 = 20$

(b) Find solution set of $3x^2 + 4x - 5 = 0$ by quadratic formula.

Sol. $3x^2 + 4x - 5 = 0$

Compare it with $ax^2 + bx + c = 0$

Here $a = 3, b = 4, c = -5$

As $$x = \frac{-b \pm \sqrt{b^2 - 4ax}}{2a} = \frac{-4 \pm \sqrt{(4)^2 - 4(3)(-5)}}{2(3)} = \frac{-4 \pm \sqrt{16 + 60}}{6}$$

$$x = \frac{-4 \pm \sqrt{76}}{6} = \frac{-4 \pm 2\sqrt{19}}{6} = 2\left(\frac{-2 \pm \sqrt{19}}{6}\right) = \frac{-2 \pm \sqrt{19}}{3}$$

$$S.S = \left\{\frac{-2 \pm \sqrt{19}}{3}\right\}$$

Q6. (a) Solve the system of linear equations $2x - y = -2$, $x + 2y = 3$ by inversion matrix method.

Sol. $2x - y = -2$

$x + 2y = 3$

The Matrix form is

$$\begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -2 \\ 3 \end{bmatrix}$$

Let $AX = B$ _____(i)

Here $$A = \begin{bmatrix} 2 & -1 \\ 1 & 2 \end{bmatrix}, B = \begin{bmatrix} -2 \\ 3 \end{bmatrix}, \quad X = \begin{bmatrix} x \\ y \end{bmatrix}$$

By inversion method

From (i) $X = A^{-1}B$ ____(ii)

$$A^{-1} = \frac{1}{|A|}\text{Adj}A \quad \text{_____(iii)}$$

$$|A| = \begin{vmatrix} 2 & -1 \\ 1 & 2 \end{vmatrix} = 4 + 1 = 5 \neq 0$$

$$\text{Adj}\,A = \begin{bmatrix} 2 & 1 \\ -1 & 2 \end{bmatrix}$$

$\Rightarrow$ (iii) becomes

$$A^{-1} = \frac{1}{5}\begin{bmatrix} 2 & 1 \\ -1 & 2 \end{bmatrix}$$

putting values in (ii)

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{5}\begin{bmatrix} 2 & 1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} -2 \\ 3 \end{bmatrix}$$

$$= \frac{1}{5}\begin{bmatrix} -4+3 \\ 2+6 \end{bmatrix} = \frac{1}{5}\begin{bmatrix} -1 \\ 8 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -\frac{1}{5} \\ \frac{8}{5} \end{bmatrix}$$

$\Rightarrow$ $$x = -\frac{1}{5}, y = \frac{8}{5}$$

(b) Simplify: $[(100111)_2 + (10101)_2] - (10111)_2$ by changing into decimal system.

Sol. $[(100111)_2 + (10101)_2] - (10111)_2$

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

$= (100101)_2$

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