Rawalpindi Board 2024

Objective Type

HSSC-(Part-I)-Annual-2024

Roll No.____ *To be filled in by the candidate.* (For all sessions) | Paper Code | 6 | 9 | 8 | 5 |

BUSINESS MATHEMATICS (Commerce) **Time: 15 Minutes** **Marks: 10**

Note: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

Q1

1. **Roots of the quadratic $x^2 + 3x + 2 = 0$ are :**
   (A) $-1, 2$ (B) $-1, -2$ (C) $1, -2$ (D) $1, 2$
2. $(1111)_2 - (11)_2 =$
   (A) $(10010)_2$ (B) $(11010)_2$ (C) $(10100)_2$ (D) $(1100)_2$
3. **The point $(5, -3/2)$ lies in :**
   (A) 1st - quadrant (B) 2nd - quadrant (C) 3rd - quadrant (D) 4th - quadrant
4. **A square matrix A is said to be Skew-symmetric if:**
   (A) $A^t = A$ (B) $A^t = A^2$ (C) $A^t = 2A$ (D) $A^t = -A$
5. **If order of matrix $A = 3 \times 5$, order of matrix $B = 5 \times 4$, then order of $AB =$**
   (A) 3×3 (B) 3×4 (C) 5×5 (D) 5×3
6. **The decimal number 9 in binary system =**
   (A) $(1000)_2$ (B) $(1011)_2$ (C) $(1001)_2$ (D) $(1100)_2$
7. **30 seconds : 5 minutes**
   (A) 1 : 10 (B) 6 : 1 (C) 1 : 6 (D) 10 : 1
8. **20% of 9000 is :**
   (A) 1500 (B) 2000 (C) 1800 (D) 1900
9. **If $11x - 9 = 9x - 3$, then x =**
   (A) 2 (B) 3 (C) 5 (D) 4
10. **Compound interest after n years computed on the principal amount P at the rate of R per annum is :**
    (A) $P[(1 + R)^n - 1]$ (B) $P[(1 + R)^n + 1]$ (C) $P[(1 - R)^n + 1]$ (D) $P(1 + R)^n - 1$

Answers:

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

Subjective Type

Roll No.____ To be filled in by the candidate. *HSSC-(Part-I)-Annual-2024* *(For all sessions)*

BUSINESS MATHEMATICS *Time: 1.45 Hours* *Marks: 40*

SECTION - I

Q2 **Attempt any six parts from the following:-** **(6×2=12)**

(i) Define proportion.

Ans. Proportion is the equality of two ratios. The first and last terms are called extremes, while two middle terms are called means. In every proportion product of extremes is always equal to product of means.

(ii) Divide 5000 in ratio 2 : 3

Sol. Given ratio = 2 : 3

Sum of ratio = $2 + 3 = 5$

$$\text{1st share} = \frac{5000}{5} \times 2 = \text{Rs. } 2000 \quad , \quad \text{2nd share} = \frac{5000}{5} \times 3 = \text{Rs. } 3000$$

(iii) 600 is 10% of what number?

Sol. Using the formula of abc, $ab = 100c$

$$10 \times b = 100 \times 600 \Rightarrow b = \frac{100 \times 600}{10} = 6000$$

(iv) **Find simple interest on Rs. 5000 @ 6% for 4 years.**

Sol. P = Rs. 5000, I = 6% = 0.06, N = 4 years, S.I = ?

S.I = PIN = $5000 \times 0.06 \times 4$ = Rs. 1200

(v) **Define Annuity.**

Ans. The regular, fixed and periodic sequence of payments with the charging of compound interest accordingly is called an annuity.

(vi) **Solve** $\frac{7x+8}{3x+1} = \frac{5}{3}$

Sol. $$\frac{7x+8}{3x+1} = \frac{5}{3}$$

By cross multiplication

$$(7x+8)\,3 = 5\,(3x+1)$$
$$21x+24 = 15x+5$$
$$21x-15x = 5-24$$
$$6x = -19$$
$$x = \frac{-19}{6}$$

(vii) **Five times of a number is 150. What is the number?**

Sol. Let the number = x

$$5x = 150 \Rightarrow x = \frac{150}{5} = 30$$

(viii) **Find the sum and product of the quadratic equation $x^2 - 5x + 6 = 0$**

Sol. $x^2 - 5x + 6 = 0$

Here $a = 1,\ b = -5,\ c = 6$

$$\text{Sum of roots} = \alpha + \beta = \frac{-b}{a} = \frac{-(-5)}{1} = 5$$

$$\text{Product} = \alpha\beta = \frac{c}{a} = \frac{6}{1} = 6$$

(ix) **Solve $x^2 - 5x + 6 = 0$ by factorization.**

Sol. $x^2 - 5x + 6 = 0 \Rightarrow x^2 - 2x - 3x + 6 = 0 \Rightarrow x(x-2) - 3(x-2) = 0$

$(x-2)(x-3) = 0 \Rightarrow x-2 = 0,\ x-3 = 0 \Rightarrow x = 2,\ x = 3$

S.S. = {(2, 3)}

Q5 Attempt any six parts from the following:- **(6×2=12)**

(i) **If $f(x) = 3x + 9$, find $f\left(\frac{1}{2}\right)$.**

Sol. $f(x) = 3x + 9$

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

$$f\left(\frac{1}{2}\right) = 3\left(\frac{1}{2}\right) + 9 = \frac{3}{2} + 9 = \frac{3+18}{2} = \frac{21}{2}$$

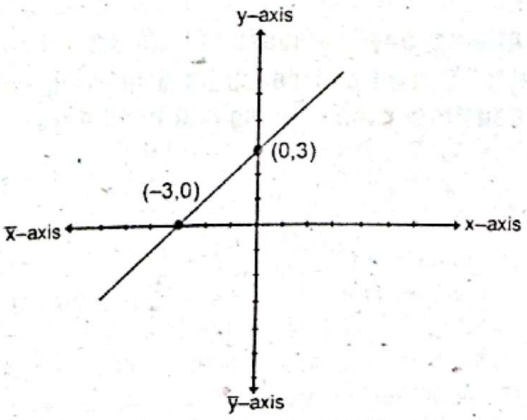
(ii) **Sketch the graph of $f(x) = x + 3$**

Sol. $f(x) = x + 3$

Let $y = x + 3$

x-intercep is (–3,0) and

y-intercept is (0,3)



(iii) Convert $(1101)_2$ into decimal system.

Sol. $(1101)_2$

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

$= 1 \times 8 + 1 \times 4 + 0 \times 2 + 1 \times 1 \qquad \because 2^0 = 1$

$= 8 + 4 + 0 + 1 = 13$

(iv) Convert 25 into binary system.

Sol.

2	25
2	12 – 1
2	6 – 0
2	3 – 0
	1 – 1

So, $25 = (11001)_2$

(v) Find the sum of $(1001)_2$ and $(111)_2$.

Sol.

$$\begin{array}{r} (1^1 0^1 0^1 1)_2 \\ +\quad (1\ 1\ 1)_2 \\ \hline (10000)_2 \end{array}$$

(vi) What is 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 $[a_{ij}]$ of order $n \times m$.

(vii) Find AB if $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$.

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

$$AB = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 \\ 4 \end{bmatrix} = \begin{bmatrix} 3+8 \\ 9+16 \end{bmatrix} = \begin{bmatrix} 11 \\ 25 \end{bmatrix}$$

(viii) Find value of x, When $\begin{bmatrix} 8 & x \\ 2 & 4 \end{bmatrix}$ is singular matrix.

Sol. Let $A = \begin{bmatrix} 8 & x \\ 2 & 4 \end{bmatrix}$

If A is singular then

$$|A| = 0 \quad \Rightarrow \quad \begin{vmatrix} 8 & x \\ 2 & 4 \end{vmatrix} = 0$$

$$32 - 2x = 0 \quad \Rightarrow \quad 2x = 32 \quad \Rightarrow \quad x = 16$$

(ix) Find the adjoint of matrix $\begin{bmatrix} -1 & -2 \\ 3 & 4 \end{bmatrix}$

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

$$\text{Adj}A = \begin{bmatrix} 4 & 2 \\ -3 & -1 \end{bmatrix}$$

SECTION - II

Note: Attempt any two question from the following. **(8×2=16)**

Q4 (a) If 20 men can construct a housing unit in 60 days. How many men are required to construct such housing unit in 48 days?

Sol.

Men		Days
↓ 20	:	↑ 60
x	:	48

By proportion $20 : x :: 48 : 60$

Product of means = Product of extremes

$(48)(x) = (60)(20)$

$48x = 1200 \quad \Rightarrow \quad x = 25$

Thus, 25 means are required to construct a house in 48 days.

(b) **Rs. 3000 amount to Rs. 6843.70 in 17 years compounded annually, what is the rate?**

Sol. Given Amount = A = 6843.70

Principal = P = 3000

n = 17 years

i = ?

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

$6843.70 = 3000\,(1+i)^{17}$

$\frac{6843.70}{3000} = (1+i)^{17}$

$2.281233 = (1+i)^{17}$

$\text{Log}(2.28) = \text{Log}(1+i)^{17}$

$0.3582 = 17\,\text{Log}(1+i)$

$\frac{0.3582}{17} = \text{Log}(1+i)$

$0.0211 = \text{Log}(1+i)$

$\text{Anti log}(0.0211) = 1+i$

$1.0498 = 1+i$

$\Rightarrow i = 1.0498 - 1$

$= 0.0498$

$i = \frac{0.0498}{100} \times 100$

$= 5\%$

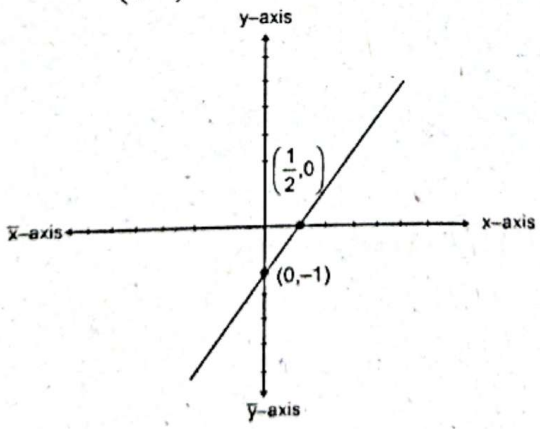
So, the annual interest rate is 5%.

05 **(a) Find *x–intercept* and *y*–intercept of f(x) = 2*x* – 1. Also draw the graph of *f*(*x*) = 2*x* – 1.**

Sol.

X-intercept	Y-intercept
put y = 0	put x = 0
0 = 2x – 1	y = 2(0) – 1
$x = \frac{1}{2}$	y = – 1
$\Rightarrow \left(\frac{1}{2}, 0\right)$	$\Rightarrow (0,-1)$

Graph



(b) Solve the equation : $\frac{1}{x}+\frac{1}{x+1}=\frac{2}{x+3}$

Sol.

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

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

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

By cross multiplication

$$(2x+1)(x+3) = 2(x^2+x)$$

$$2x^2+6x+x+3 = 2x^2+2x$$

$$7x+3 = 2x$$

$$7x-2x+3 = 0$$

$$5x = -3$$

$$x = -\frac{3}{5}$$

Q6. **(a) Solve the system of linear equations by Cramer rule:** $2x-3y=1$, $x+4y=6$

Sol. Given system of linear equation

$$2x-3y = 1$$

$$x+4y = 6$$

The matrix form

$$\begin{bmatrix} 2 & -3 \\ 1 & 4 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 \\ 6 \end{bmatrix}$$

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

by crammer rule

$$x = \frac{|A_x|}{|A|} = \frac{\begin{vmatrix} 1 & -3 \\ 6 & 4 \end{vmatrix}}{\begin{vmatrix} 2 & -3 \\ 1 & 4 \end{vmatrix}} = \frac{4+18}{8+3}$$

$$= \frac{22}{11} = 2$$

and $$y = \frac{|A_y|}{|A|} = \frac{\begin{bmatrix} 2 & 1 \\ 1 & 6 \end{bmatrix}}{\begin{bmatrix} 2 & -3 \\ 1 & 4 \end{bmatrix}}$$

$$= \frac{12-1}{8+3} = \frac{11}{11} = 1$$

$$y = 1$$

(b) Evaluate: $[(1011)_2 \times (111)_2] - (101)_2$

Sol. $[(1011)_2 \times (111)_2] - (101)_2$

$= (1001101)_2 - (101)_2$

$= (1001000)_2$

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

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