

Objective Type

HSSC-(P-I)-A-2023

Roll No. _____ To be filled in by the candidate.

(For all sessions)

Paper Code 6 9 8 4

BUSINESS MATHEMATICS

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. A rectangular array of elements is called.

(A) Vector

(B) Row Matrix

(C) Columns

(D) Matrix

2. The determinant Matrix $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is:

(A) Zero

(B) One

(C) Two

(D) Three

3. The ratio between 3.5 and 7 is:

(A) 5 : 1

(B) 1 : 5

(C) 1 : 2

(D) 2 : 1

4. 25% of Rs. 500 is:

(A) 75

(B) 100

(C) 125

(D) 150

5. Loan is Rs. 1000/- for 5 years @ 5% p.a. Simple interest is:

(A) 200

(B) 250

(C) 300

(D) 350

6. The function $f(x) = \frac{1}{x}$ is not defined as:

(A) 1

(B) -1

(C) 0

(D) 2

7. If $2x - 3 = x + 4$, then value of x is:

(A) 5

(B) 7

(C) 1

(D) 4

8. In quadratic equation the highest degree of variable is:

(A) 1

(B) 2

(C) 3

(D) 4

9. Conversion of $(7)_{10}$ into binary system is:(A) $(110)_2$ (B) $(100)_2$ (C) $(111)_2$ (D) $(101)_2$ 10. $(10110)_2$ in decimal number is:

(A) 20

(B) 22

(C) 24

(D) 26

Answers:

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

Roll No. _____ To be filled in by the candidate.

Inter-(Part-I)-A-2023 (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) Find the ratio between one hour and 30 minutes.

Sol. Ratio between one hour and 30 minutes, One hour = 60 minutes

$$60 : 30 \Rightarrow 2 : 1$$

(ii) Find the value of x, if $x : 250 :: 4 : 50$ Sol. $x : 250 :: 4 : 50$

$$\frac{x}{250} = \frac{4}{50} \Rightarrow 50x = 250 \times 4 \Rightarrow 50x = 1000 \Rightarrow x = \frac{1000}{50} = 20$$

(iii) Calculate 5% of Rs. 5000.

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

$$(5)(5000) = 100c \Rightarrow c = \frac{5 \times 5000}{100} \Rightarrow c = \frac{25000}{100} = 250$$

(iv) Find the simple interest on Rs. 5000 invested for 3 years at 12% per annum.

Sol. Principal amount (P) = 5000, Interest rate (I) = $12\% = \frac{12}{100} = 0.12$, N = 3

$$S.I = PIN = 5000 \times 0.12 \times 3 = 1800$$

(v) Define compound interest.

Ans. The interest chargeable to changing principal on every period of deal is called compound interest.

(vi) Solve the equation: $9x + 4 = 4x + 29$

Sol. $9x + 4 = 4x + 29 \Rightarrow 9x - 4x = 29 - 4$

$$5x = 25 \Rightarrow x = \frac{25}{5} = 5$$

(vii) Find x, if $2x - 7 = 13$

Sol. $2x - 7 = 13 \Rightarrow 2x = 13 + 7$

$$2x = 20 \Rightarrow x = \frac{20}{2} = 10$$

(viii) Solve the Quadratic equation by factorization: $x^2 - 4x - 32 = 0$

Sol. $x^2 - 4x - 32 = 0$

$$x^2 - 8x + 4x - 32 = 0$$

$$x(x - 8) + 4(x - 8) = 0$$

$$(x - 8)(x + 4) = 0$$

$$x - 8 = 0$$

;

$$x + 4 = 0$$

$$x = 8$$

;

$$x = -4$$

(ix) Write down the two methods to solve the quadratic equation.

Ans. (i) Factorization (ii) Quadratic formula

13 Attempt any six parts from the following:

(6 × 2 = 12)

(i) If $f(x) = x^2 + 5x - 4$, then find $f(-1)$, $f(1)$

Sol. $f(x) = x^2 + 5x - 4$

put $x = -1$

$$f(-1) = (-1)^2 + 5(-1) - 4 = 1 - 5 - 4 = -8$$

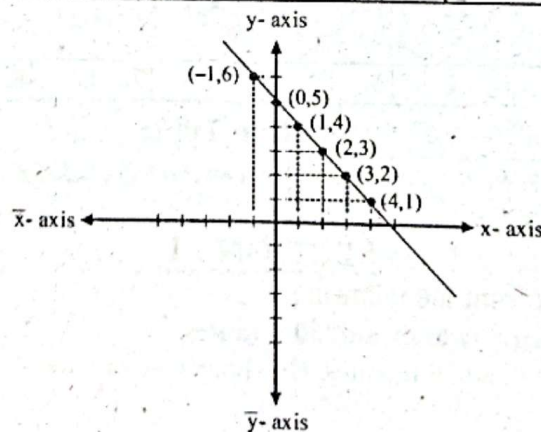
put $x = 1$

$$f(1) = (1)^2 + 5(1) - 4 = 1 + 5 - 4 = 2$$

(ii) Draw the graph of $f(x) = -x + 5$

Sol. $f(x) = -x + 5$

x	-1	0	1	2	3	4
y = f(x)	6	5	4	3	2	1



(iii) Convert $(11001)_2$ into decimal number system.

Sol. $(11001)_2$

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

$$= 1 \times 16 + 1 \times 8 + 0 + 0 + 1 \times 1 = 16 + 8 + 0 + 0 + 1 = 25$$

(iv) Simplify $(11001)_2 - (111)_2$

Sol. $(1100)_2 - (111)_2 = (101)_2$

$$\begin{array}{r} (1100)_2 \\ - (111)_2 \\ \hline (101)_2 \end{array}$$

(v) Convert 241 into binary system.

2	241		
2	120	-	1
2	60	-	0
2	30	-	0
2	15	-	0
2	7	-	1
2	3	-	1
	1	-	1

So, $241 = (11110001)_2$

(vi) Find AB if $A = \begin{bmatrix} 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 \\ 5 \end{bmatrix}$

Sol. $AB = \begin{bmatrix} 3 & 4 \end{bmatrix} \begin{bmatrix} 4 \\ 5 \end{bmatrix} = [(3 \times 4) + (4 \times 5)] = (12 + 20) = 32$

(vii) If $A = \begin{bmatrix} 2 & -3 \\ -7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 2 & -6 \end{bmatrix}$ Find $(A + B)^t$

Sol. $A = \begin{bmatrix} 2 & -3 \\ -7 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 2 & -6 \end{bmatrix}$

$$A + B = \begin{bmatrix} 2 & -3 \\ -7 & 5 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 2 & -6 \end{bmatrix} = \begin{bmatrix} 3 & -3 \\ -5 & -1 \end{bmatrix}$$

$$(A + B)^t = \begin{bmatrix} 3 & -3 \\ -5 & -1 \end{bmatrix}^t = \begin{bmatrix} 3 & -5 \\ -3 & -1 \end{bmatrix}$$

(viii) Find value of x, the matrix $\begin{bmatrix} x & 2 \\ 3 & 4 \end{bmatrix}$ has no inverse?

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

The matrix A having no inverse if $|A| = 0$

$$\Rightarrow \begin{vmatrix} x & 2 \\ 3 & 4 \end{vmatrix} = 0 \Rightarrow 4x - 6 = 0$$

$$4x = 6 \Rightarrow x = \frac{3}{2}$$

(ix) Find determinant $\begin{bmatrix} -7 & 5 \\ -2 & 3 \end{bmatrix}$

Sol. $\begin{vmatrix} -7 & 5 \\ -2 & 3 \end{vmatrix} = (-7)(3) - (5)(-2) = -21 + 10 = -11 \neq 0$

SECTION - II

Note: Attempt any two question from the following.

(2 × 8 = 16)

Q4. (a) Twenty men complete the construction of bridge in 7 days. How many men are required to complete the construction work in 5 days.

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

Men	:	Days
20	:	7
x(say)	:	5

We are seeing from the above table that smaller the days, more the men required to complete the job within given period. Thus the given problem is a case of inverse proportion so,

$$20 : x :: 5 : 7$$

Product of extremes = Product of means

$$20 \times 7 = (5)(x)$$

$$5x = 140 \Rightarrow x = 28$$

Thus 28 men are required to do the job in 5 days.

(b) If Rs. 3000 are invested at 6% interest compounded semi-annually. What would it amount at the end of 8 years.

Sol.

$$P = \text{Rs. } 3000$$

$$i = 6\% \text{ annually}$$

$$= 0.06 \text{ annually}$$

$$i = \frac{0.06}{2} \text{ per semi annually}$$

$$= 0.03 \text{ per semi annually}$$

$$n = 8 \text{ years}$$

$$= 8 \times 2 = 16 \text{ semi years}$$

$$A = P(1+i)^n$$

$$= 3000(1+0.03)^{16}$$

$$= 3000(1.03)^{16}$$

$$= 3000(1.6047) = 4814.12$$

Q5. (a) Draw the graph of $4x + 2y = 10$

Sol. Given: $4x + 2y = 10$ (i)

As we know that the graph of linear function is a straight line and above given function is line. So its graph will be a straight line by taking two points only. The most suitable two points are intercept form.

X - Intercept

put $y = 0$ in (i)

$$4x + 2(0) = 10$$

$$4x = 10$$

$$x = \frac{5}{2}$$

$$\Rightarrow \left(\frac{5}{2}, 0\right)$$

Y - intercept

put $x = 0$ in (i)

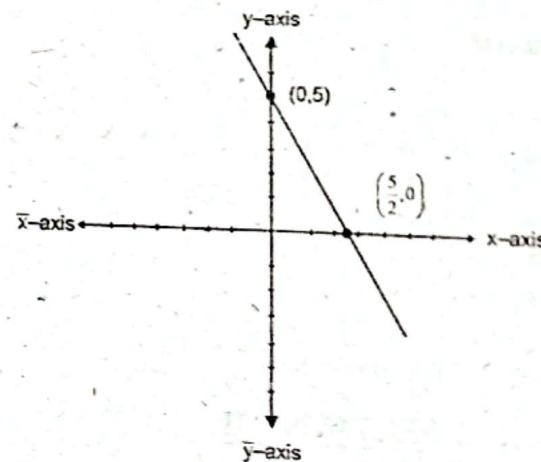
$$4(0) + 2y = 10$$

$$2y = 10$$

$$y = 5$$

$$\Rightarrow (0, 5)$$

Graph



(b) Solve $x^2 - 5x + 2 = 0$ by completing square.

Sol.

$$x^2 - 5x + 2 = 0$$

$$x^2 - 5x = -2$$

Add $\left(\frac{5}{2}\right)^2$ on both side

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

$$\left(x - \frac{5}{2}\right)^2 = -2 + \frac{25}{4}$$

$$\left(x - \frac{5}{2}\right)^2 = \frac{-8 + 25}{4} = \frac{17}{4}$$

Tacking square root on both side

$$\sqrt{\left(x - \frac{5}{2}\right)^2} = \sqrt{\frac{17}{4}}$$

$$x - \frac{5}{2} = \pm \frac{\sqrt{17}}{2}$$

$$x = \frac{5}{2} \pm \frac{\sqrt{17}}{2} = \frac{5 \pm \sqrt{17}}{2}$$

$$S.S = \left\{ \frac{5 \pm \sqrt{17}}{2} \right\}$$

Q6 (a) Solve by using inverse of a matrix

$$5x - 4y = -8$$

$$-3x + 5y = 7$$

Sol. Given

$$5x - 4y = -8$$

$$-3x + 5y = 7$$

The matrix form is

$$\begin{bmatrix} 5 & -4 \\ -3 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -8 \\ 7 \end{bmatrix}$$

Let $AX = B$ (i)

$$\text{Here } A = \begin{bmatrix} 5 & -4 \\ -3 & 5 \end{bmatrix}, B = \begin{bmatrix} -8 \\ 7 \end{bmatrix}, X = \begin{bmatrix} x \\ y \end{bmatrix}$$

From (i)

$$X = A^{-1}B \quad \text{(ii)}$$

$$\text{Now } |A| = \begin{vmatrix} 5 & -4 \\ -3 & 5 \end{vmatrix} = 25 - 12 = 13$$

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

$$A A^{-1} = \frac{1}{|A|} \text{Adj}A = \frac{1}{13} \begin{bmatrix} 5 & 4 \\ 3 & 5 \end{bmatrix}$$

\Rightarrow (ii) becomes

$$X = \frac{1}{13} \begin{bmatrix} 5 & 4 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} -8 \\ 7 \end{bmatrix}$$

$$X = \frac{1}{13} \begin{bmatrix} -40 + 28 \\ -24 + 35 \end{bmatrix} = \begin{bmatrix} -12 \\ 11 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{-12}{13} \\ \frac{11}{13} \end{bmatrix}$$

$$\Rightarrow x = \frac{-12}{13} \text{ and } y = \frac{11}{13}$$

(b) Simplify $\{(10111011)_2 - (101110)_2\} + (1000000)_2$

$$\text{Sol. } \{(10111011)_2 - (101110)_2\} + (1000000)_2$$

$$= (10001101)_2 + (1000000)_2$$

$$= (11001101)_2$$

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

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