Sahiwal Board 2023

Objective Type

Roll No. | | | | | | | (To be filled in by the candidate)

BUSINESS MATHEMATICS H.S.S.C (11th)1st-A-2023 Time: 15 Minutes

Paper: I Marks: 10

Paper Code | 6 | 6 | 4 | 1 |

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct; fill that circle in front of that question number in you answer book. Use marker or pen to fill the circles. Cutting or filling up two or more circles will result no mark.

SECTION – A

Q1.

Sr.	Questions	A	B	C	D
1.	The ration between 2.5 kg and 4.5 kg is:	2 : 5	5 : 9	9 : 5	2 : 3
2.	Rs. 250 is what percent of Rs. 1000?	1.5%	2.5%	3.5%	25%
3.	The formula for finding rate%:	$\frac{I\times100}{P}$	$\frac{I\times100}{P\times T}$	$\frac{P\times100}{I\times T}$	$\frac{T\times100}{P\times I}$
4.	If $f(x)=\sqrt{x+9}$, then $f(x^2-9)=$	$x+9$	$x2-9$	$x2$	x
5.	If $x-3=2x+9$, then	$x=-12$	$x=12$	$x=6$	$x=-6$
6.	The solution set of $3x^2+4x+1=0$ is:	$\{\frac{1}{3},1\}$	$\{\frac{-1}{3},1\}$	$\{\frac{-1}{3},-1\}$	$\{\frac{1}{3},-1\}$
7.	Conversion of 4 into binary system is:	$(10)_2$	$(11)_2$	$(101)_2$	$(100)_2$
8.	$(10000)_2$ in deimal system is equal to:	18	20	17	16
9.	If order of matrix A is 2×3 and order of matrix B is 3×4, then order of AB is:	2×2	2×4	3×3	3×4
10.	If $A=\begin{bmatrix}8 & 9\\12 & 15\end{bmatrix}$, then order of A^{-1} is:	1×1	2×3	2×2	3×3

Answers:

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

Subjective Type

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BUSINESS MATHEMATICS H.S.S.C (11th)1st-A-2023 Time: 1.45 Hours

Paper: I Marks: 40

Note: Section B is compulsory. Attempt any Two Questions from Section C.

SECTION - B

Q2. Write short answers to any Six parts: (6×2=12)

(i) Distribute Rs. 15000 in the ratio 3:2

Sol.

Given ratio $= 3 : 2$

Sum of ratio $= 3+2=5$

$$\text{Share of 1st person} = \frac{15000}{5}\times3 = 3000\times3 = 9000$$

$$\text{Share of 2nd person} = \frac{15000}{5}\times2 = 3000\times2 = 6000$$

(ii) **Find the missing term from the proportion 2:3 :: ☐ :15**

Sol. Let x be the missing term then

$$2:3::x:15$$

$$\text{Product of mean} = \text{Product of extreme}$$

$$3x = 30$$

$$x = 10$$

(iii) **A dealer bought a bicycle for Rs. 15500 and sold for Rs. 16740. Find profit percentage.**

Sol.

$$\text{Purchasing price} = 15500$$

$$\text{Selling price} = 16740$$

$$\text{Profit} = 16740 - 15500 = 1240$$

$$\text{Profit percentage} = \left(\frac{\text{Profit}}{\text{Purchase}} \times 100\right)\% = \left(\frac{1240}{15500} \times 100\right)\% = 8\%$$

(iv) **Find the simple interest on Rs. 5000 invested for 6 months at the rate 8% per annum.**

Sol.

$$\text{Principal amount (p)} = \text{Rs. } 5000$$

$$\text{Interest rate (I)} = 8\% = 0.09$$

$$\text{Time} = N = 2 \text{ month} = \frac{6}{12} = 0.5$$

$$S.I = PIN = (5000)(0.09)(0.5) = 225$$

(v) **Define the term 'ordinary annuity'.**

Ans. If every payment is made at end of each payment period and continue for a definite period is called ordinary annuity. It can be calculate as:

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

(vi) **Solve $4(x-7) = 3(2x+1) - 5$.**

Sol. So,

$$4(x-7) = 3(2x+1) - 5$$

$$4x - 28 = 6x + 3 - 5$$

$$4x - 28 = 6x - 2$$

$$4x - 6x = -2 + 28$$

$$-2x = 26$$

$$-x = 13$$

$$x = -13$$

(vii) **Find two consecutive integers whose sum is 29.**

Sol. Let x and x + 1 be the two integers.

$$x + x + 1 = 29$$

$$2x + 1 = 29$$

$$2x = 29 - 1$$

$$2x = 28$$

$$x = 14$$

$\Rightarrow$ $x = 14$ and $x + 1 = 14 + 1 = 15$

(viii) **Solve $4x^2 - 11x + 6 = 0$ by completing square.**

Sol.

$$4x^2 - 11x + 6 = 0$$

Divide b.s by 4

$$\frac{4x^2}{4} - \frac{11}{4}x + \frac{6}{4} = 0$$

$$x^2 - \frac{11}{4}x = -\frac{3}{2}$$

Adding $\left(\frac{11}{3}\right)^2$ on bs

$$x^2-\frac{11}{4}(x)+\left(\frac{11}{8}\right)^2=-\frac{3}{2}+\left(\frac{11}{8}\right)^2$$

$$\left(x-\frac{11}{8}\right)^2=-\frac{3}{2}+\frac{121}{64}=\frac{-96+121}{64}=\frac{25}{64}$$

Taking square root on bs

$$\sqrt{\left(x-\frac{11}{8}\right)^2}=\sqrt{\frac{25}{64}}$$

$$x-\frac{11}{8}=\pm\frac{5}{8}$$

$$x-\frac{11}{8}=\frac{5}{8} \quad ; \quad x-\frac{11}{8}=-\frac{5}{8}$$

$$x=\frac{5}{8}+\frac{11}{8} \quad ; \quad x=-\frac{5}{8}+\frac{11}{8}$$

$$x=\frac{5+11}{8}=\frac{16}{8} \quad ; \quad x=\frac{-5+11}{8}=\frac{6}{8}$$

$$x=2 \quad ; \quad x=\frac{3}{4}$$

(ix) Discuss the nature of the roots of $x^2-5x+6=0$

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

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

Disc $=b^2-4ac=(-5)^2-4(1)(6)=25-24=1$

Roots will be rational (real) and unequal.

13. Write short answers to any Six parts: **(6×2=12**

(i) Define profit function.

Ans. The profit function represents the difference between the total revenue a business receive from selling its good or services and the total costs incurs.

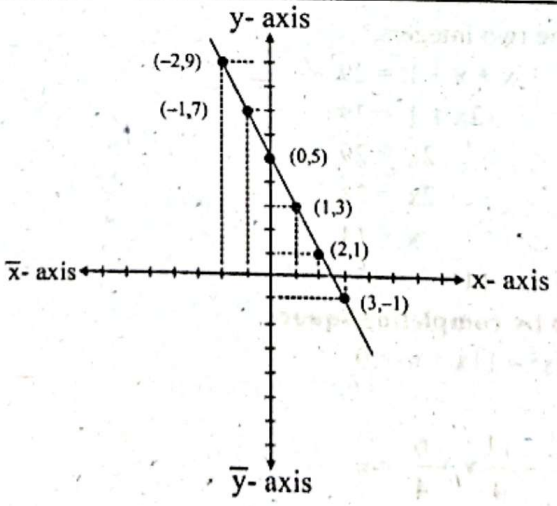
(ii) Sketch the graph of 4x+2y=10

Sol. $4x+2y=10$

$2y=10-4x$

$y=5-2x$

x	−2	−1	0	1	2	3
y	9	7	5	3	1	−1



(iii) Subtract $(1101)_2$ from $(10011)_2$.

Sol.

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

(iv) **Evaluate $(100111)_2 \times (111)_2$.**

Sol.

$$\begin{array}{cccccccc} & & & & (1 & 0 & 0 & 1 & 1 & 1)_2 \\ & & & & & & \times & (1 & 1 & 1)_2 \\ \hline & & & & 1^1 & 0^2 & 0^2 & 1^1 & 1 & 1 \\ & & & 1^1 & 0 & 0 & 1 & 1 & 1 & \times \\ & & 1^1 & 0 & 0 & 1 & 1 & 1 & \times & \times \\ \hline (1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1)_2 \end{array}$$

(v) **Convert $(10110011)_2$ into decimal system.**

Sol. $(10110011)_2$

$= 1 \times 2^7 + 0 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 + 0 \times 2^3 + 0 \times 2^2 + 1 \times 2^1 + 1 \times 2^0$

$= 1 \times 128 + 0 + 1 \times 32 + 1 \times 16 + 0 + 0 + 1 \times 2 + 1 \times 1$

$= 128 + 0 + 32 + 16 + 0 + 0 + 2 + 1 = 179$

(vi) **If $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$; $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$, then find AB.**

Sol. $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$

$$AB = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} = \begin{bmatrix} 1\times1+2\times3+3\times5 & 1\times2+2\times4+3\times6 \\ 4\times1+5\times3+6\times5 & 4\times2+5\times4+6\times6 \end{bmatrix}$$

$$AB = \begin{bmatrix} 1+6+15 & 2+8+18 \\ 4+15+30 & 8+20+36 \end{bmatrix} = \begin{bmatrix} 22 & 28 \\ 49 & 64 \end{bmatrix}$$

(vii) **If $A = \begin{bmatrix} 2 & 5 \\ x & -10 \end{bmatrix}$ is a singular matrix, then find the value of x.**

Sol. $$A = \begin{bmatrix} 2 & 5 \\ x & -10 \end{bmatrix}$$

As A is singular matrix

So, $$|A| = 0$$

$$\begin{vmatrix} 2 & 5 \\ x & -10 \end{vmatrix} = 0$$

$$-20 - 5x = 0$$

$$-5x = 20$$

$$x = -4$$

(viii) **Define skew symmetric matrix**

Ans. A square matrix "A" will be skew symmetric matrix if $A^t = -A$

(ix) **If $A = \begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$; find the value of $|2A|$**

Sol. $A = \begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix}$

$$2A = 2\begin{bmatrix} 1 & 2 \\ 4 & 9 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 8 & 18 \end{bmatrix}$$

$$|2A| = \begin{vmatrix} 2 & 4 \\ 8 & 18 \end{vmatrix} = 36 - 32 = 4$$

SECTION - C

Note: Attempt any Two questions. Each question carries 4+4=8 marks. (2 × 8=16)

Q4. (a) If 15 workers paint 5 houses in a day, then how many workers are required to paint 3 houses in a day?

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

Workers		Houses
↑ 15	:	↑ 5
↑ x(say)	:	↑ 3

By proportion method

$$x : 15 :: 3 : 5$$

$$\frac{x}{15} = \frac{3}{5}$$

Tacking cross multiplication

$(x)(5) = (15)(3)$

$5x = 45$

$x = 9$

Thus 9 workers are required to point 3 houses in a day.

(b) Find the compound amount at the end of one year if Rs. 10,000 are invested at 10% interest compounded annually.

Sol. $P = 1,0000$

$r = 10\%$ annually

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

$n = 1$ year

As. $A = P(1+r)^n$

$A = 10,000\,(1+0.1)^1$

$= 10,000\,(1.1)$

$= 10,000\,(1.1)$

$A = 11000$

Q5. (a) Draw the graph of function $y = x^2 + 2x - 3$

Sol. Given function is

$$y = x^2 + 2x - 3$$

Let $y = f(x)$

$\Rightarrow$ $y = f(x) = x^2 + 2x - 3$

$f(x) = x^2 + 2x - 3$

$\Rightarrow$ $f(3) = (3)^2 + 2(3) - 3 = 9 + 6 - 3 = 12$

$f(2) = (2)^2 + 2(2) - 3 = 4 + 4 - 3 = 5$

$f(1) = (1)^2 + 2(1) - 3 = 1 + 2 - 3 = 0$

$f(0) = (0)^2 + 2(0) - 3 = -3$

$f(-1) = (-1)^2 + 2(-1) - 3 = 1 - 2 - 3 = -4$

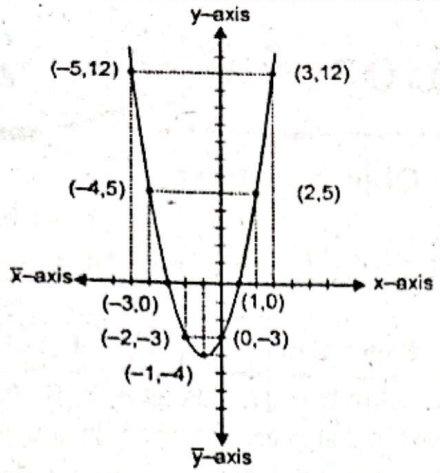
$f(-2) = (-2)^2 + 2(-2) - 3 = 4 - 4 - 3 = -3$

$f(-3) = (-3)^2 + 2(-3) - 3 = 9 - 6 - 3 = 0$

$f(-4) = (-4)^2 + 2(-4) - 3 = 16 - 8 - 3 = 5$

$f(-5) = (-5)^2 + 2(-5) - 3 = 25 - 10 - 3 = 12$

Graph



(b) **Solve the equations:**
$2x - y = 11$
$x + 4 = 1$

Sol.
$$2x - y = 11 \quad \text{_____(i)}$$
$$x + 4 = 1 \quad \text{_____(ii)}$$

From (ii)
$$x = -4 + 1 = -3$$
Put $x = -3$ in (i)
$$2(-3) - y = 11$$
$$-6 - y = 11$$
$$-6 - 11 = y \Rightarrow y = -17$$

Q6 (a) If $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$ **and** $B = \begin{bmatrix} 2 & -1 \\ 1 & 1 \end{bmatrix}$ **then show that** $(AB)^t = B^tA^t$.

Sol.
$$A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & -1 \\ 1 & 1 \end{bmatrix}$$
$$AB = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ 1 & 1 \end{bmatrix}$$
$$= \begin{bmatrix} 2+2 & -1+2 \\ 8-2 & -4-3 \end{bmatrix} = \begin{bmatrix} 4 & 1 \\ 5 & -7 \end{bmatrix}$$
$$(AB)^t = \begin{bmatrix} 4 & 1 \\ 5 & -7 \end{bmatrix}^t = \begin{bmatrix} 4 & 5 \\ 1 & -7 \end{bmatrix} \text{_____(i)}$$

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

And
$$B^t = \begin{bmatrix} 2 & -1 \\ 1 & 1 \end{bmatrix}^t = \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix}$$

$\Rightarrow$
$$B^tA^t = \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 2 & -3 \end{bmatrix}$$
$$= \begin{bmatrix} 2+2 & 8-3 \\ -1+2 & -4-3 \end{bmatrix} = \begin{bmatrix} 4 & 5 \\ 1 & -7 \end{bmatrix} \text{_____(ii)}$$

From (i) and (ii)
$$(AB)^t = B^tA^t$$

(b) **Multiply $(11011)_2$ and $(101)_2$**

Sol. Multiply $(11011)_2$ and $(101)_2$

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