Objective Type

BUSINESS MATHEMATICS   **11th CLASS - 1st Annual 2023**   **PAPER CODE - 6641**

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 that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

Q1.

No	Questions	A	B	C	D
1.	The ratio between 1.5 cm and 4.5 cm is:	2 : 5	3 : 1	1 : 3	2 : 3
2.	If 7% of the amount is Rs. 490, then what is the amount?:	Rs. 4000	Rs. 5000	Rs. 6000	Rs. 7000
3.	A fee which is paid for having the use of money is called:	Interest	Principal	Percentage	Annuity
4.	If $f(x) = 4x^2 - 5x + 1$, then f(−x) =:	$4x^2-5x-1$	$4x^2+5x+1$	$4x^2+5x-1$	$4x^2-5x+1$
5.	The solution set of $\sqrt{x+3} = 4$ is:	{1}	{ }	{−1}	{±1}
6.	The solution set of $8x^2 - 14x - 15 = 0$:	$\left\{\frac{5}{2}, \frac{-3}{4}\right\}$	$\left\{\frac{-5}{2}, \frac{-3}{4}\right\}$	{−1,−3}	$\left\{\frac{-5}{2}, \frac{3}{4}\right\}$
7.	8 in binary system is equal to:	$(1001)_2$	$(1010)_2$	$(1000)_2$	$(1011)_2$
8.	$(1111)_2$ in decimal system is equal to:	23	13	25	15
9.	If order of matrix A is 3×4 and order of matrix B is 4×2, then order of AB is:	2×3	3×4	4×2	3×2
10.	If A = $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ then $A^t =$	$\begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$	$\begin{bmatrix} 1 & 3 \\ 2 & 4 \\ 5 & 6 \end{bmatrix}$	$\begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$	$\begin{bmatrix} 1 & 2 \\ 3 & 5 \\ 4 & 8 \end{bmatrix}$

Answers:

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

Subjective Type

11th CLASS- 1st Annual 2023

BUSINESS MATHEMATICS

Time: 1.45 Hours   **SECTION - I**   Marks: 40

Q2. Write short answers of any Six (6) parts of the following.   12

(i) Divide Rs. 750 in the ratio 3 : 2

Sol.
Sum of ratio $= 3 + 2 = 5$

Amount $=$ Rs. 750

Share of 1st person $= \dfrac{3}{5} \times 750 =$ Rs. 450 ,   Share of 2nd person $= \dfrac{2}{5} \times 750 =$ Rs. 300

(ii) Find x if $x : \dfrac{1}{4} :: 12 : 3$

Sol. Given: $x : \dfrac{1}{4} :: 12 : 3$

We know that: Product of extremes = Product of means

$3x = \dfrac{1}{4} \times 12 \Rightarrow 3x = 3 \Rightarrow x = 1$

(iii) A dealer buys a bicycle for Rs. 1200 and sells it for Rs. 1500. Find percentage profit.

Sol.

Cost = Rs. 1200

Selling price = Rs. 1500

Profit = 1500 − 1200 = 300

$$\text{Profit percentage} = \left(\frac{\text{Profit}}{\text{Cost}} \times 100\right)\% = \left(\frac{300}{1200} \times 100\right)\% = \left(\frac{1}{4} \times 100\right)\% = (25)\% = 25\%$$

(iv) Find the simple interest to Rs. 6000 borrowed for 3 years at the rate 8% per annum.

Sol.

Principal amount (P) = 6000

$$\text{Interest rate} = 8\% = \frac{8}{100} = 0.08$$

$$N = 3$$

$$\text{S.I} = PIN = 6000 \times 0.08 \times 3 = 1440$$

(v) Define the term " simple annuity".

Ans. A simple annuity is the annuity in which payment interval is same as the interest period.

OR A series of regular payments made the beginning of each period and the compond period is equal.

(vi) Solve $\dfrac{12x - 5}{3} = \dfrac{4x + 8}{4}$

Sol.

$$\frac{12x - 5}{3} = \frac{4x + 8}{4}$$

By cross multiplication

$$4(12x - 5) = 3(4x + 8)$$
$$48x - 20 = 12x + 24$$
$$48x - 12x = 24 + 20 \implies 36x = 44$$
$$9x = 11 \implies x = \frac{11}{9}$$

(vii) Find two consecutive integers whose sum is 43.

Sol.

Let 1st integer = x and 2nd integer = x + 1

Then

$$x + (x + 1) = 43$$
$$2x + 1 = 43$$
$$2x = 43 - 1 = 42$$
$$x = 21$$

So,

1st integer = 21

2nd integer x + 1 = 21 + 1 = 22

(viii) Solve $3x^2 - 9x + 5 = 0$ by completing square.

Sol.

$$3x^2 - 9x + 5 = 0$$

Divide both side by 3

$$\frac{3x^2}{3} - \frac{9x}{3} + \frac{5}{3} = 0 \qquad \because \left(3 \times \frac{1}{2} = \frac{3}{2}\right)$$

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

Adding $\left(\dfrac{3}{2}\right)^2$ on b.s

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

$$\left(x - \frac{3}{2}\right)^2 = -\frac{5}{3} + \frac{9}{4} = \frac{-20 + 27}{12} = \frac{7}{12}$$

$$\sqrt{\left(x - \frac{3}{2}\right)^2} = \sqrt{\frac{7}{12}}$$

$$x - \frac{3}{2} = \sqrt{\frac{7}{12}} \implies x = \frac{3}{2} \pm \sqrt{\frac{7}{12}}$$

(ix) Discuss the nature of the roots of $x^2 + 6x + 9 = 0$

Sol.
$$x^2 + 6x + 9 = 0$$

Here $a = 1$, $b = 6$, $c = 9$

$$Disc = b^2 - 4ac = (6)^2 - 4(1)(9) = 36 - 36 = 0$$

So, roots are real and equal

Q3 Write short answers of any Six (6) parts of the following. 12

(i) Show that $f(x) = x^5 + x^3$ is an odd function

Sol.
$$f(x) = x^5 + x^3$$

Put
$$x = -x$$

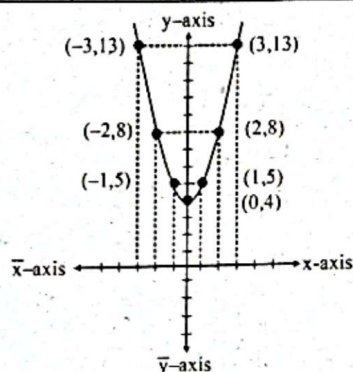$$f(-x) = (-x)^5 + (-x)^3 = -x^5 - x^3 = -(x^5 + x^3)$$

$$f(-x) = -f(x)$$

So $f(x)$ is odd function.

(ii) Sketch the graph of the function $f(x) = x^2 + 4$

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

x	−3	−2	−1	0	1	2	3
y = f(x)	13	8	5	4	5	8	13

(iii) Find the sum of $(23)_2 + (111)_2$

Sol. $(23)_2 + (111)_2 = (10111)_2 + (111)_2$

```
  (1   0¹   1¹   1¹   1)₂
+           (1    1    1)₂
-----------------------------
  (1   1    1    1    0)₂
```

$$= (11110)_2$$

(iv) Evaluate $(11011)_2 - (1101)_2$

Sol. $(11011)_2 - (1101)_2$

```
  (1   1   0   1   1)₂
-     (1   1   0   1)₂
-----------------------
  (0   1   1   1   0)₂
```

$$= (1110)_2$$

(v) Evaluate $(10101)_2 \times (111)_2$

Sol.
```
            (1   0   1   0   1)₂
        ×       (1   1   1)₂
    ------------------------------
            1¹  0¹   1   0·  1
        1¹  0   1   0   1   ×
    1¹  0   1   0   1   ×   ×
    ------------------------------
    (1  0·  0   1   0   0   1   1)₂
```

$$= (10010011)_2$$

(vi) Find |A| Given that $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 3 & 2 \end{bmatrix}$

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

$|A| = \begin{vmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 3 & 2 \end{vmatrix} = 1\begin{vmatrix} 2 & 1 \\ 3 & 2 \end{vmatrix} - 2\begin{vmatrix} 3 & 1 \\ 1 & 2 \end{vmatrix} + 3\begin{vmatrix} 3 & 2 \\ 1 & 3 \end{vmatrix}$

$|A| = 1(4-3) - 2(6-1) + 3(9-2) = 1(1) - 2(5) + 3(7) = 1 - 10 + 21 = 12$

(vii) Find the inverse of A, where $A = \begin{bmatrix} 5 & 3 \\ 4 & 2 \end{bmatrix}$

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

$A^{-1} = \dfrac{1}{|A|} \text{ Adj } A \underline{\hspace{2cm}}$ (i)

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

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

So, (i) becomes.

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

(viii) Find the value of x, $A = \begin{bmatrix} 3 & 2 \\ 4 & 6x \end{bmatrix}$ if |A| = 0

Sol. $A = \begin{bmatrix} 3 & 2 \\ 4 & 6x \end{bmatrix}$

As $\qquad |A| = 0$

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

$(3)(6x) - (4)(2) = 0$

$18x - 8 = 0$

$18x = 8$

$9x = 4$

$x = \dfrac{4}{9}$

(ix) Find AB if $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

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

$AB = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix} = \begin{bmatrix} 1\times2+2\times4 & 1\times3+2\times5 \\ 3\times2+4\times4 & 3\times3+4\times5 \end{bmatrix} = \begin{bmatrix} 2+8 & 3+10 \\ 6+16 & 9+20 \end{bmatrix} = \begin{bmatrix} 10 & 13 \\ 22 & 29 \end{bmatrix}$

SECTION - II

2×8=16

Q4. (a) If 6 pumps raise 108 liters of water in 12 minutes, how long will 4 pumps take to raise 96 liters of water?

Sol.

Pumps		Water(letters)		Time (minutes)
6	:	108	:	12
4 (decrease)	:	96 (decrease)	:	x

$$\Rightarrow \quad \frac{x}{12} = \frac{6}{4} \times \frac{96}{108}$$

$$\frac{x}{12} = \frac{576}{432}$$

$$x = \frac{576}{432} \times 12 = 16$$

$$x = 16$$

(b) Find the compound interest due in case of Rs. 1000 loaned for 5 years at 6% annually.

Sol. It is given that

Principal = $\quad$ P $\quad$ = Rs. 1000

$\qquad$ i $\quad$ = 6% annually

$\qquad\qquad$ = 0.06 annually

$\quad$ Time $\quad$ = n = 5 years

$\qquad$ A $\quad$ = P (1 + i)^n

$\qquad\qquad$ = 1000 (1+0.06)^5

$\qquad\qquad$ = 1000 (1.3382)

$\qquad\qquad$ = 1338.22

Compound Interest $\quad$ = C.I = A – P

$\qquad\qquad$ = 1338.22 – 1000

$\qquad\qquad$ = 338.22

Q5. (a) If $f(x) = x^2 - 2x + 1$, find $f(-1)$, $f(0)$, $f(2)$ and $f(3)$

Sol.

$\qquad$ f(x) $\quad$ = $x^2 - 2x + 1$ _____(i)

$\qquad$ Put x $\quad$ = – 1 in (i)

$\qquad$ f(–1) $\quad$ = $(-1)^2 - 2(-1) + 1$

$\qquad\qquad$ = 1 + 2 + 1 = 3

$\qquad$ F (–1) $\quad$ = 3

$\qquad$ Put x $\quad$ = 0 in (i)

$\qquad$ f(0) $\quad$ = $(0)^2 - 2(0) + 1 = 0 + 0 + 1$

$\qquad$ f(0) $\quad$ = 1

$\qquad$ Put x $\quad$ = 2 in (i)

$\qquad$ f(2) $\quad$ = $(2)^2 - 2(2) + 1 = 4 - 4 + 1$

$\qquad$ f(2) $\quad$ = 1

$\qquad$ Put x $\quad$ = 3 in (i)

$\qquad$ f(3) $\quad$ = $(3)^2 - 2(3) + 1$

$\qquad\qquad$ = 9 - 6 + 1 = 9 - 5 = 4

$\qquad$ f(3) $\quad$ = 4

(b) Solve $x^2 - 3x + 8 = 0$ using Quadratic Formula

Sol. $x^2 - 3x + 8 = 0$

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

Here $a = 1$, $b = -3$, $c = 8$

By quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ax}}{2a}$$

Putting values of a,b and c

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(8)}}{2(1)}$$

$$= \frac{3 \pm \sqrt{9 - 32}}{2} = \frac{3 \pm \sqrt{-23}}{2}$$

$$= \frac{3 \pm \sqrt{23}}{2}$$

$$S.S = \left\{\frac{3 \pm \sqrt{23}}{2}\right\}$$

Q6. (a) Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} y & 1 \\ -3 & 2x \end{bmatrix}$

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

By defination of equal matrices

$$x + 3 = y \quad \underline{\quad}(i)$$

$$3y - 4 = 2x \quad \underline{\quad}(ii)$$

From (i)

$$x - y + 3 = 0 \quad \underline{\quad}(iii)$$

From (ii)

$$2x - 3y + 4 = 0 \quad \underline{\quad}(iv)$$

Multiply eq (iii) with 2 and subtract from (iv)

$$2x - 3y + 4 = 0$$

$$\underline{2x - 2y + 6 = 0}$$

$$-y - 2 = 0$$

$$y = -2 \text{ put in (i)}$$

$$x + 3 = -2$$

$$x = -2 - 3 = -5$$

$$x = -5$$

So, $x = -5$, $y = -2$

(b) Multiply $(11111)_2$ and $(1111)_2$

Sol. $(11111)_2 \times (1111)_2$

```
              (1   1   1   1   1)₂
          ×       (1   1   1   1)₂
          _____
                1³  1²  1¹  1   1
            1³   1   1   1   1   ×
        1³   1   1   1   1   ×   ×
    1²   1   1   1   1   ×   ×   ×
    _____
    (1   1   1   0   1   0   0   0   1)₂
```