IQRA NATIONAL UNIVETSITY, PESHAWAR

DEPARTMENT OF CIVIL ENGINEERING

FINAL TERM EXAMINATION

Subject: Applied Mathematics1

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A student is nothing without Teacher

01 (a) Solve system with two variables by Cramer. Rules.

Sol=

$$A = \begin{bmatrix} 1 & -2 \\ 3 & 1 \end{bmatrix}, \quad B = \begin{pmatrix} 1 \\ 10 \end{pmatrix}, \quad X = \begin{bmatrix} x \\ y \end{bmatrix}$$

By Cramer Rules

$$x = \frac{Ax}{|A|}, \quad y = \frac{Ay}{|A|} \quad \text{---(A)}$$

$$Ax = \begin{bmatrix} 1 & -2 \\ 10 & 1 \end{bmatrix}$$

$$|Ax| = \begin{vmatrix} 1 & -2 \\ 10 & 1 \end{vmatrix} = 1(1) - 10(-2)$$

$$|Ax| = 1 + 20$$

$$|Ax| = 21$$

$$Ay = \begin{bmatrix} 1 & 1 \\ 3 & 10 \end{bmatrix}$$

$$|Ay| = \begin{vmatrix} 1 & 1 \\ 3 & 10 \end{vmatrix}$$

$$|Ay| = 1(10) - 3(1) = (7)$$

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

$$|A| = 1 \times 1 - 3 \times (-2)$$

$$|A| = 1 \times 1 - 3 \times (-2) = |A| = 1 + 6 = 7$$

Putting in equation (A)

$$x = \frac{|Ax|}{|A|}, \quad y = \frac{|Ay|}{|A|}$$

$$x = \frac{21}{7}, \quad y = \frac{7}{7}$$

$$x = 3, \quad y = 1$$

Q No 01 (B) Solve the variable by Inversion method

Sol = $x - 3y = 0$

$2x + y = 7$

① $A = \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix}$, $B \begin{bmatrix} 0 \\ -7 \end{bmatrix}$, $X = \begin{bmatrix} x \\ y \end{bmatrix}$

using inversing method

$X = A^{-1}B \rightarrow (A)$

Now first find A^{-1}

$A^{-1} = \frac{1}{|A|}$ adj of A —— (1)

$A = \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix} = |A| = 1(1) - 2(-3) = 1 + 6 = 7$

$|A| = 7$ ——

$A = \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix} \Rightarrow$ Adj of $A = \begin{bmatrix} 1 & 3 \\ -2 & 1 \end{bmatrix}$

Put in equation (1)

$A^{-1} = \frac{1}{|A|}$ Adj of $A \Rightarrow \frac{1}{7}\begin{bmatrix} 1 & 3 \\ -2 & 1 \end{bmatrix}$

Putting in eqn (A)

$$X = A^{-1} \cdot B$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{7}\begin{pmatrix} 1 & 3 \\ -2 & 1 \end{pmatrix}\begin{pmatrix} 0 \\ 7 \end{pmatrix} \Rightarrow \begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{7}\begin{pmatrix} 1\times(0) + 3\times(-7) \\ -2\times 0 + 1\times -7 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{7}\begin{pmatrix} -21 \\ -7 \end{pmatrix} \Rightarrow \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} \frac{-21}{7} \\ \frac{-7}{7} \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$$

$x = -3, \; y = 1$

Ans

Q No 02 (a) Solve the following Quadratic equations by using Factorization method

Sol = $4y^2 + 15y + 6 - 4y = 0$

$4y^2 + 11y + 6 = 0$

using factorization Method

$4y^2 + 11y + 6 = 0$

$4y^2 + 8y + 3y + 6 = 0$

$4y(y+2) + 3(y+2) = 0$

$(y+2)(4y+3) = 0$

$y + 2 = 0, \quad 4y + 3 = 0$

$\boxed{y = -2}, \quad \frac{4y}{4} = \frac{-3}{4}$

$\boxed{y = \frac{-3}{4}}$

$S.S = \left\{ -2, \frac{-3}{4} \right\}$

Q No 02 B)

$\int 01 = x^2 + 15x = -50$

$x^2 + 15x + 50 = 0$

using factorization

$x^2 + 15x + 50 = 0$

$x^2 + 15 + 50 = 0$

$x^2 + 10x + 5x + 50 = 0$

$x(x+10) + 5(x+10) = 0$

$(x+10)(x+5) = 0$

$x + 10 = 0, \quad x + 5 = 0$

$x = -10, \quad x = -5$

$S.S = \{-10, -5\}$

$50x^2$

$10x$

$5x$

$50x$

$10x$

$5x$

$15x$

Q.No 02
(C)

Sol = $y^2 = 6y + 27$

$= y^2 - 6y - 27 = 0$

Using Factorization Me-

$y^2 - 9y + 3y - 27 = 0$

$y(y-9) + 3(y-9) = 0$

$(y-9)(y+3) = 0$

$y-9 = 0 \quad (y+3) = 0$

$y-9 = 0, \quad y+3 = 0$

$y = 9, \quad y = -3$

$S.S = \{9, -3\}$

-27
$\times y^2$
$-27y^2$
$-9y$
$\times +3y$
$-27y^2$
$-9y$
$+3y$
$-6y$

Q3 (A) The sum of two number is 27 and their product is 50. Find the number let one number be x, then the other number is 50/x

Sol:

$$x + \frac{50}{x} = 27$$

$$x^2 + 50 = 27x$$

$$x^2 - 27x + 50 = 0$$

$$(x-25) = 0 \text{ or } (x-2) = 0$$

$$x = 25 \qquad x = 2$$

Ans.

03 (B) Three sides of a right angled triangle are x, $x+1$ and 5. Find x and the area if the longest side is 5.

Sol= Given data:

The hypotenuse = 5

$x^2+(x+1)^2=5^2$ (pythagoras theorm)

$x^2+x^2+2x+1=25$

$-25 \Rightarrow x^2+x^2+2x-24=0$

$2x^2+2x-24=0$

$x^2+x-12=0$

$(x-3)(x+4)=0$

$(x+4)=0$ or $(x-3)=0$

$x=-4$ or $x=3$

$x=3$

Area $= \frac{1}{2} \times 3 \times 4 =$ $6cm^2$