

ID : 1801396

Date : 11/05/20

code : M4X00391

Time : 13:00

Q1 a) i) $7+5j + (-2+6j)$
 $= 5+11j$

ii) $7+5j - -2+6j$
 $= 9-j$

iii) $\frac{7+5j}{-2+6j} \times \frac{-2-6j}{-2-6j} \Rightarrow \frac{-14 - 42j - 10j - 30j^2}{4 + 12j - 12j - 36j^2}$
 $\downarrow$

$$\frac{16 - 52j}{40} = \frac{16}{40} + \frac{-52j}{40}$$

iv) $7-5j - 3+j$
 $= 4+2j$

v) $(7+5j)(7+5j) - (3+7j)(2+6j)$
 $49 + 35j + 35j + 25j^2 - 3 + 7j + 2 + 6j$
 $24 + 70j - (3 + 7j + 2 + 6j)$
 $24 + 70j - 3 + 7j + 2 - 6j$
 $= 23 + 71j$

b) $12x^2 + 5x + 13 = 0 \Rightarrow \frac{-5 \pm \sqrt{5^2 - 4 \times 12 \times 13}}{2 \times 12}$

$$x = \frac{-5}{24} + \frac{24.47}{24} \quad \text{or} \quad \frac{-5}{24} - \frac{24.47}{24} = \frac{-5 \pm 24.47}{24}$$

$$x = -0.21 + 1.02$$

$$r = \sqrt{0.21^2 + 1.02^2} = 1.04$$

$$\theta = \tan^{-1}\left(\frac{1.02}{0.21}\right) = 78.37^\circ$$

$$\theta = 180 - 78.37 = 101.63^\circ$$

$$1.04(\cos(101.63) + j \sin(101.63))$$

$$\text{or } -0.21 - 1.02$$

$$r = 1.04$$

$$\theta = 180 + 78.37 = 258.37^\circ$$

$$1.04(\cos 258.37 + j \sin 258.37)$$

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c) $(4+9j)^4$

$$r = \sqrt{4^2 + 9^2} = 9.85$$

$$\theta = \tan^{-1}\left(\frac{9}{4}\right) = 66.04^\circ$$

$$\begin{aligned} \text{DMT} &= 9.85^4 (\cos 4 \times 66.04 + j \sin 4 \times 66.04) \\ &= 9413.37 (\cos 264.16 + j \sin 264.16) \\ &= -957.82 - 9364.51j \end{aligned}$$

ii) $(-5-2j)^5$

$$r = \sqrt{5^2 + 2^2} = 5.39$$

$$\theta = \tan^{-1}\left(\frac{2}{5}\right) = 21.8^\circ \rightarrow 180 + 21.8 = 201.8^\circ$$

$$\begin{aligned} \text{DMT} &= 5.39^5 (\cos 5 \times 201.8 + j \sin 5 \times 201.8) \\ &= 4549.29 (\cos 1009 + j \sin 1009) \\ &= 1481.1 - 4301.44j \end{aligned}$$

d) $-1 \times -1 = 1$

e) $(5-2j)(1-6j)(3-2j)$

$$(5-30j-2j+12j^2)(3-2j)$$

$$(-7-32j)(3-2j)$$

$$-21 + 14j - 96j + 64j^2$$

$$= -85 - 82j$$

$$r = \sqrt{85^2 + 82^2} = 118.11$$

$$\theta = \tan^{-1}\left(\frac{82}{85}\right) = 43.97^\circ \rightarrow 180 + 43.97 = 223.97^\circ$$

$$\text{pf} = 118.11 (\cos 223.97 + j \sin 223.97)$$

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Q3

a) i) $7x2 + 6x2 + 5x4 = 46$

$$7x0 + 6x0 + 5x3 = 15$$

$$7x2 + 6x1 + 5x2 = 30$$

$$2x2 + 8x2 + -7x4 = -8$$

$$2x0 + 8x0 + -7x3 = -21$$

$$2x2 + 8x1 + -7x2 = -2$$

$$2x2 + 1x2 + 0x4 = 6$$

$$2x0 + 1x0 + 0x3 = 0$$

$$2x2 + 1x1 + 0x2 = 5$$

$$= \begin{bmatrix} 46 & 15 & 30 \\ -8 & -21 & -2 \\ 6 & 0 & 5 \end{bmatrix}$$

ii) $2x7 + 0x2 + 2x2 = 18$

$$2x6 + 0x8 + 2x1 = 14$$

$$2x5 + 0x-7 + 2x0 = 10$$

$$2x7 + 0x2 + 1x2 = 16$$

$$2x6 + 0x8 + 1x1 = 13$$

$$2x5 + 0x-7 + 1x0 = 10$$

$$= \begin{bmatrix} 18 & 14 & 10 \\ 16 & 13 & 10 \\ 38 & 50 & -1 \end{bmatrix}$$

$$4x7 + 3x2 + 2x2 = 38$$

$$4x6 + 3x8 + 2x1 = 50$$

$$4x5 + 3x-7 + 2x0 = -1$$

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$$\text{iii) } \left. \begin{array}{l} 7 \times 5 + 6 \times 3 + 5 \times 1 = 58 \\ 7 \times 4 + 6 \times 2 + 5 \times 0 = 40 \end{array} \right\}$$

$$2 \times 5 + 8 \times 3 + -7 \times 1 = 27$$

$$2 \times 4 + 8 \times 2 + -7 \times 0 = 24$$

$$2 \times 5 + 1 \times 3 + 0 \times 1 = 13$$

$$2 \times 4 + 1 \times 2 + 0 \times 0 = 10$$

$$= \begin{bmatrix} 58 & 40 \\ 27 & 24 \\ 13 & 10 \end{bmatrix}$$

iv) = Cant be done

$$\text{v) } \begin{array}{ccc} 7 & 6 & 5 \\ & 2 & 8 & -7 \\ & & 2 & 1 & 0 \end{array}$$

$$7 \times 8 \times 0 = 0$$

$$2 \times 1 \times 5 = 10$$

$$2 \times 6 \times -7 = -84$$

$$10 - 84 = -74$$

$$\begin{array}{ccc} 7 & 6 & 5 \\ & 3 & 8 & -7 \\ & & 2 & 1 & 0 \end{array}$$

$$2 \times 8 \times 5 = 80$$

$$-7 \times 1 \times 7 = -49$$

$$0 \times 2 \times 6 = 0$$

$$80 - 49 = 31$$

triangle method

$$D = -74 - 31 = -105$$

$$\text{vi) } \begin{array}{ccc} 2 & 0 & 2 \\ & 2 & 0 & 1 \\ & & 4 & 3 & 2 \end{array}$$

$$2 \times 0 \times 2 = 0$$

$$2 \times 3 \times 2 = 12$$

$$4 \times 0 \times 1 = 0$$

$$12$$

$$\begin{array}{ccc} 2 & 0 & 2 \\ & 3 & 0 & 1 \\ & & 4 & 3 & 2 \end{array}$$

$$4 \times 0 \times 2 = 0$$

$$1 \times 3 \times 2 = 6$$

$$2 \times 0 \times 2 = 0$$

$$6$$

$$D = 12 - 6 = 6$$

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vii)
$$\begin{array}{ccc} 9 & 6 & 7 \\ 4 & 8 & -6 \\ 6 & 4 & 2 \end{array}$$

viii) cant be done

b) $14x^2 + 2x - 11 = 0$

$$\downarrow$$

$$\frac{-2 \pm \sqrt{2^2 - 4 \times 14 \times -11}}{2 \times 14} = \frac{-2 \pm 24.9}{28}$$

$$x = 0.82 \text{ or } -0.96$$

c)

$\begin{array}{ccc} 2x & 0 & -2 \\ 4 & 5 & 1 \\ 5 & (x+1) & 3 \end{array}$ $2x \times 5 \times 3 = 30x$ $4x + 4 \times -2 = -8x$ $5 \times 0 \times 1 = 0$ $-8x + 4$	$\begin{array}{ccc} 2x & 0 & -2 \\ 4 & 5 & 1 \\ 5 & (x+1) & 3 \end{array}$ $5 \times 5 \times -2 = -50$ $1x + 1 \times 2x = 3x + 1$ $4 \times 0 \times 3 = 0$ $20x^2 - 49$
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$$-2x^2 - 8x + 53 = 2$$

$$-2x^2 - 8x + 51 = 0$$

$$x = \frac{8 \pm \sqrt{8^2 - 4 \times -2 \times 51}}{2 \times -2} = \frac{8 \pm 21.73}{-4}$$

$$x = -7.43 \text{ or } 3.43$$

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d)

x	y	z	
2	3	2	14
1	2	5	4
3	1	-2	19

$$\begin{array}{c|c}
 \begin{array}{ccc}
 2 & 3 & 2 \\
 1 & 2 & 5 \\
 3 & 1 & -2
 \end{array} &
 \begin{array}{ccc}
 2 & 3 & 2 \\
 1 & 2 & 5 \\
 3 & 1 & -2
 \end{array} \\
 \hline
 2 \times 2 \times 2 = -8 & 3 \times 2 \times 2 = 12 \\
 3 \times 3 \times 5 = 45 & 5 \times 1 \times 2 = 10 \\
 1 \times 1 \times 2 = 2 & 1 \times 3 \times -2 = -6 \\
 \hline
 39 & 16
 \end{array}$$

$$D = 39 - 16 = 23$$

$$\begin{array}{c|c}
 \begin{array}{ccc}
 14 & 3 & 2 \\
 4 & 2 & 5 \\
 19 & 1 & -2
 \end{array} &
 \begin{array}{ccc}
 14 & 3 & 2 \\
 4 & 2 & 5 \\
 19 & 1 & -2
 \end{array} \\
 \hline
 14 \times 2 \times -2 = -56 & 19 \times 2 \times 2 = 76 \\
 4 \times 1 \times 2 = 8 & 4 \times 3 \times -2 = -24 \\
 19 \times 3 \times 5 = 285 & 5 \times 1 \times 14 = 70 \\
 \hline
 237 & 122
 \end{array}$$

$$237 - 122 = 115$$

$$\frac{D_{oc}}{D} = \frac{115}{23} = 5 \rightarrow 5$$

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$$D_y \begin{array}{ccc|ccc} 2 & 14 & 2 & 2 & 14 & 2 \\ 1 & 4 & 5 & 1 & 4 & 5 \\ 3 & 19 & -2 & 3 & 19 & -2 \end{array}$$

~~write~~

$$\frac{D_y}{0} = \frac{46}{23} = 2$$

$$D_z \begin{array}{ccc|ccc} 2 & 3 & 14 & 2 & 3 & 14 \\ 1 & 2 & 4 & 1 & 2 & 4 \\ 3 & 1 & 19 & 3 & 1 & 19 \end{array}$$

$$\frac{D_z}{0} = \frac{-23}{23} = -1$$