Kris Patel

OLA 4: Matrix, Graphs and Trees CSCI-3080

1.

$x + 5y = 1$
$2x - 3y = 15$

$$\begin{array}{c} R_1 \\ R_2 \end{array}\left[\begin{array}{cc|c} 1 & 5 & 1 \\ 2 & -3 & 15 \end{array}\right] \xrightarrow{-2(R_1)+(R_2)} \left[\begin{array}{cc|c} 1 & 5 & 1 \\ 0 & -13 & 13 \end{array}\right] \xrightarrow{R_2/-13} \left[\begin{array}{cc|c} 1 & 5 & 1 \\ 0 & 1 & -1 \end{array}\right]$$

$x + 5y = 1$
$\boxed{y = -1}$

$x + 5(-1) = 1$
$\boxed{x = 6}$

2.

$$A = \begin{bmatrix} 2 & 1 \\ -1 & 0 \\ 3 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 4 & 1 & 2 \\ 6 & -1 & 5 \\ 1 & 3 & 2 \end{bmatrix}$$

A·B	B.A
A·B is not possible	$\begin{bmatrix} 13 & 12 \\ 28 & 26 \\ 5 & 9 \end{bmatrix}$

3 Boolean Matrices

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

→ $A \wedge B$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

$A \vee B$

$$\begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

$A \times B$

$$\begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

4.

1. Graph (a) Edges: 3
Vertex: 3
Degree: 2,2,0

Graph (b) Edges: 4
Vertex: 3
Degree: 3,3,2

Graph (c) Edges: 3
Vertex: 3
Degree: 2,2,0

Graph b is not isomorphic because edges, degree are not same.

2. Graph (a) Edges: 9
Vertex: 5
Degree: 5,4,3,3,3

Graph (b) Edges: 9
Vertex: 5
Degree: 5,3,3,3,3

It is not isomorphic because degree from graph (a) does not match with degree of graph (b).

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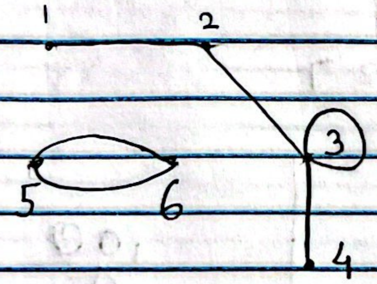
5.

$$\begin{array}{c|ccccc} & 1 & 2 & 3 & 4 & 5 \\ \hline 1 & 1 & 0 & 1 & 0 & 0 \\ 2 & 0 & 0 & 1 & 1 & 1 \\ 3 & 1 & 1 & 0 & 1 & 0 \\ 4 & 0 & 1 & 1 & 0 & 1 \\ 5 & 0 & 1 & 0 & 1 & 0 \end{array}$$

[5x5]

6.

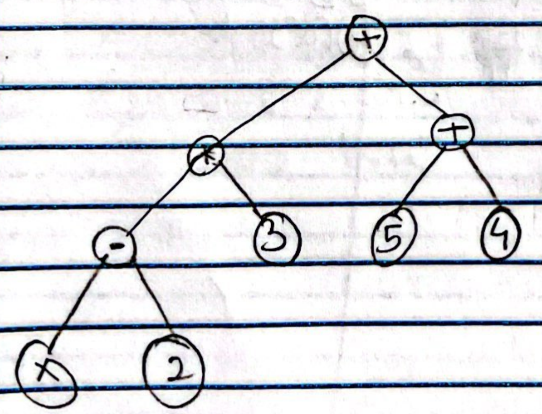


7. Adjacent List

1 → [2 |] → [3 | •]
2 → [4 | •]
3 → [4 | •]
4 → [1 | •]

8.

1.



2.

Preorder: +, *, -, x, 2, 3, +, 5, 4
Inorder: x-, 2, * 3, +, 5, +, 4
Postorder: x, 2, -, 3, *, 5, 4, +, +

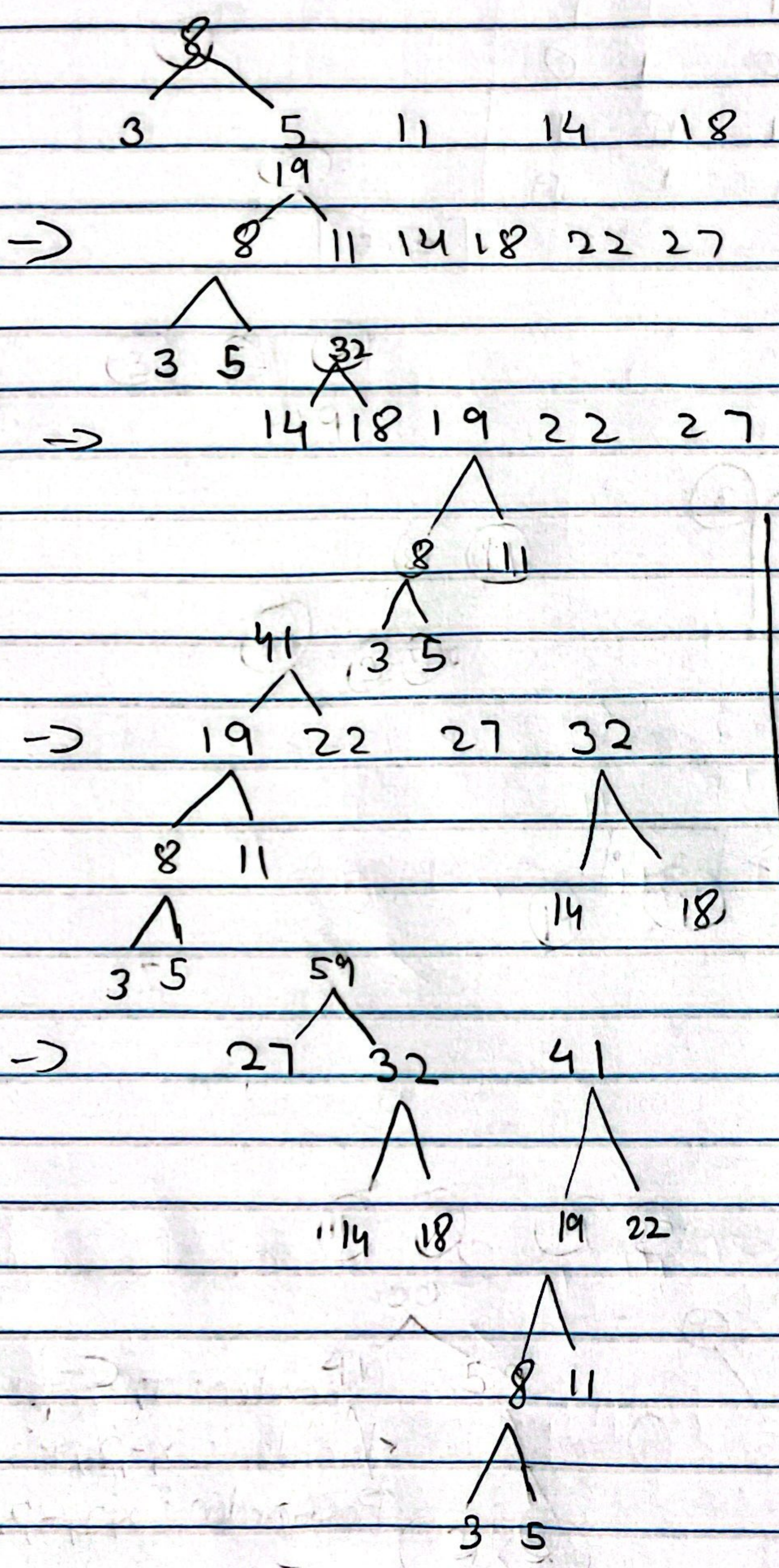
9. (1.) bh%% $\underbrace{1000}_{b}$ $\underbrace{1001}_{h}$ $\underbrace{101}_{\%}$ $\underbrace{101}_{\%}$

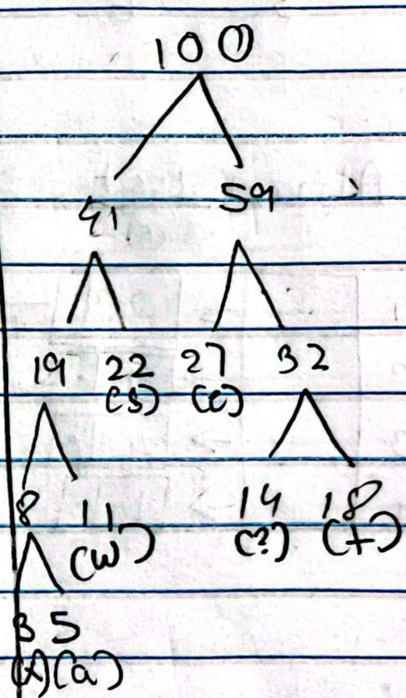
(2.) wwq $\underbrace{11}_{w}$ $\underbrace{11}_{w}$ $\underbrace{10}_{q}$

(3) q h w b $\underbrace{10}_{q}$ $\underbrace{1001}_{h}$ $\underbrace{11}_{w}$ $\underbrace{1000}_{b}$

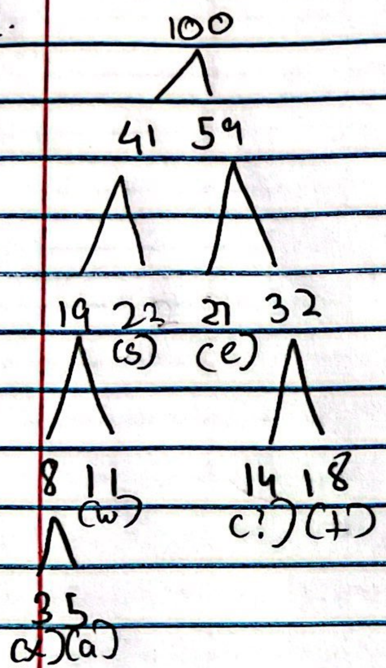
	?	x	w	e	t	s	a
10.	14	3	11	27	18	22	5

1.





2.



? : 110
x : 0000
w : 001
e : 10
t : 111
s : 01
a : 0001

$\}$ Huffman code

3. Fixed-length = 10,000 * 3 = 30,000 bits
3 bits are required for each character.

4. 8 bits are required for each character
$\cdot$ 10000 * 8 = 80,000 bits

5. Huffman = 10000 (0.14 * 3 + 0.03 * 4 + 0.11 * 3 + 0.27 * 2 + 0.18 * 3 + 0.22 * 2 + 0.05 * 4)
= 10000 (0.42 + 0.12 + 0.33 + 0.54 + 0.54 + 0.44 + 0.2)
= 10000 (2.59)
= 25900 bits

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