

Question No 1.

Roll No = 17K - 3795

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

$$K = 2.$$

Initial Seeds: $(3, 5)$ $(9, 5)$ $(4, 8)$

	$(3, 5)$	$(4, 8)$
1	0 ~	5
7	5	0 ~
3	6.08	4.472 ~
7	5	0 ~
9	1.414 ~	5.38
5	4.242	1 ~

 $(3, 5)$ $(4, 8)$ $\downarrow \leftrightarrow$ $(1, 9)$ $(7, 3, 7, 5)$ $\{(3, 5)(9, 6)\}$ $\{(4, 8)(2, 4)(4, 8)(5, 8)\}$ Centroid $(3, 5) = (8.5, 5.5)$ Centroid $(4, 8) = (3.75, 7)$

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	(8.5, 5.5)	(3.75, 7)
1	0.707 //	4.69
2	5.147	1.030 //
3	6.69	3.47 //
4	5.14	1.030 //
5	0.707 //	5.34
6	4.301	1.60. //

(1, 9)

(7, 3, 7, 5)

* No changes occur.

Cluster 1 : 1, 9.

Cluster 2 : 7, 3, 7, 5.

"Question 1b"

$C_1(1, 1) ; C_2(4, 1)$

C_1

$$(C_1, D_1) = 1 =$$

$$(C_1, D_2) = D =$$

$$(C_1, D_3) = 3 =$$

$$(C_1, D_4) = 1 =$$

$$(C_1, D_5) = 1.412 =$$

$$(C_1, D_6) = 3.162 =$$

C_2

$$(C_2, D_1) = 2$$

$$(C_2, D_2) = 3$$

$$(C_2, D_3) = 0 =$$

$$(C_2, D_4) = 3.162$$

$$(C_2, D_5) = 2.236$$

$$(C_2, D_6) = 1 =$$

$$C_1 = D_1, D_2, D_4, D_5$$

$$C_2 = D_3, D_6$$

$$\text{Centroid}(G) = \left(\frac{2+1+1+2}{4}, \left(\frac{1+1+2+2}{4} \right) \right)$$

$$= (1.5, 1.5)$$

$$\text{Centroid}(C_1) = \left(\frac{4+4}{2} \right), \left(\frac{1+2}{2} \right)$$

$$= (4, 1.5)$$

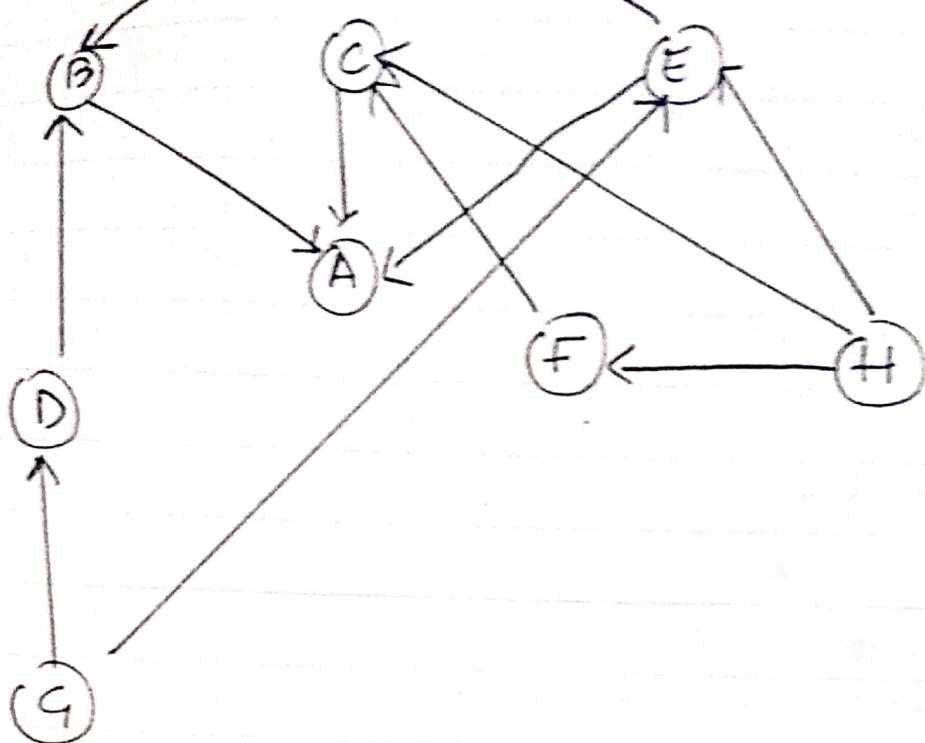
	(1.5, 1.5)	(4, 1.5)
D ₁	0.707 =	2.06
D ₂	0.707 =	3.04
D ₃	2.549	0.5 s
D ₄	0.707 =	3.04
D ₅	0.707 =	2.06
D ₆	2.549.	0.5 s

D₁, D₂, D₄, D₅ in G

D₃, D₆ in C₂

→ Same result - stop.

Question 2a.



Question 2b.

$$P(OS = \text{PASS} | ITC = \text{Pass})$$

$$P(OS = P | ITC = P) = \frac{P(OS = P) \wedge P(ITC = \text{Pass})}{P(ITC = \text{Pass})}$$

$$\begin{aligned} P(OS = P | ITC = P) &= P(OS = \text{Pass} | DS) * P(DS | OOP, ITC = \text{Pass}) \\ &\quad * P(OOP) * P(ITC = \text{Pass}) \\ &\quad \cancel{P(OS = P)} \end{aligned}$$

$$\begin{aligned} P(OS = P | ITC = P) &= P(OS = P | DS) * P(DS | OOP, ITC, P) \\ &\quad * P(OOP) \end{aligned}$$

OOP	DS	$P(OS = P DS)$	$P(DS OOP, \pi_C)$
P	P	0.3	0.2
P	F	0.8	0.8
F	P	0.3	0.3
F	F	0.8	0.7

$P(OOP)$

0.4

0.6

0.4

0.6

$$\Rightarrow (0.8 \times 0.8 \times 0.4) + (0.8 \times 0.7 \times 0.6)$$

$$*(0.3 \times 0.3 \times 0.6) + (0.3 \times 0.2 \times 0.4)$$

$$= 0.256 + 0.336 + 0.054 + 0.024$$

$$= 0.67$$

Ans

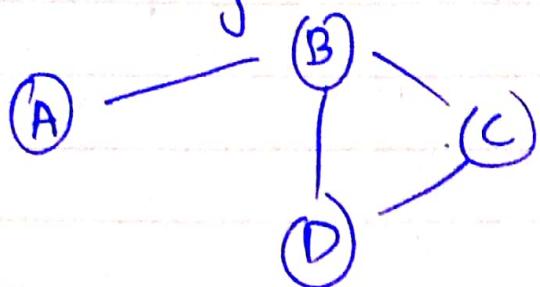
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Question 3 a.

CSP: as a set of objects whose state must satisfy give constraint or limitation.

Example Of CSP:

- MAP Coloring.



Variable: $\{A, B, C, D\}$

Domain: { Red, green, blue }.

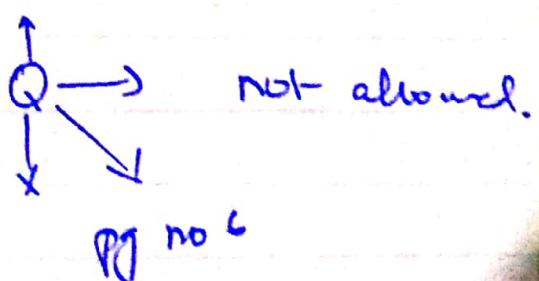
Constraint: No two adj node have same color

- n Queer prob.

Variable: $\{Q_1, Q_2, Q_3, Q_4\}$.

Domain: $\{n \times n\}$.

Const.:



- CRYPTARITHMETIC Puzzles.

TWO

T TWO

FOUR

Vari : { T, W, O, F, R, U }.

Dom : { 0 - 9 }.

Con.. : all diff.

Pg no 7.

Question 4(a):

* ML is the subset of AI.
 ML is the study of algorithms that improve their accuracy or result through expertise.

Types of ML:

- Supervised
- Unsupervised
- Reinforcement

Classification:

- use predefined classes.

- Supervised Learning

- Ex: Email is spam or not.

Clustering

- identifies similarities between objects.

Unsupervised Learning

Ex: E-Commerce Web.

Cluster (group) regular used.

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Question No 4b.

Entropy: $\sum_{\text{classes}} -P_i \log_2(P_i)$.

* Label Entropy:

Covid-19	Allergy.	Cold	Sum :
3	3	7	10

Label Entropy: $-\frac{3}{10} \log_2\left(\frac{3}{10}\right) - \frac{7}{10} \log_2\left(\frac{7}{10}\right)$.

$$\begin{array}{c} 1 \\ \diagdown \\ \frac{3}{10} \end{array} \quad \begin{array}{c} 4 \\ \diagup \\ \log_2 \left(\frac{7}{10} \right) \end{array}$$

Label Entropy = 0.881

Information Gain:

$$\text{IG (headache)} = \text{entropy (parent)} - [\text{Weig. Attr.} * \text{entropy (child)}]$$

$$= 0.881 - \left[\frac{5}{10} \times (0.97) + \frac{5}{10} (0.721) \right]$$

Yes

No.

5

5

[2+, 3-], [1+, 4-]

Question 4b.

$$-\frac{2}{5} \log_2\left(\frac{2}{5}\right) - \frac{3}{5} \log_2\left(\frac{3}{5}\right) = 0.97$$

$$-\frac{1}{5} \log_2\left(\frac{1}{5}\right) - \frac{4}{5} \log_2\left(\frac{4}{5}\right) = 0.721$$

$$IG(\text{headache}) = 0.0355$$

$$\overline{IG(\text{cough})} = 0.831 - \left[\frac{5}{10} \times (0.721) + \frac{5}{10} (0.97) \right]$$

Yes

5

[1+, 4-]

No.

5

[2+, 3-].

$$-\frac{1}{5} \log_2\left(\frac{1}{5}\right) - \frac{4}{5} \log_2\left(\frac{4}{5}\right) = 0.721$$

$$-\frac{2}{5} \log_2\left(\frac{2}{5}\right) - \frac{3}{5} \log_2\left(\frac{3}{5}\right) = 0.97$$

$$IG(\text{cough}) = 0.0355$$

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$$IG(\text{Fever}) = 0.881 - \left[0 + 0 \right] = 0.881$$

Yes	No
3	7
$[3+, 0]$	$[0, 7-]$
$e = 0$	$e = 0$

$$IG(\text{Fever}) = 0.881$$

$$IG(\text{30}) = 0.881 - \left[\frac{3}{10}(0.543) + 0 \right] = 0.4466$$

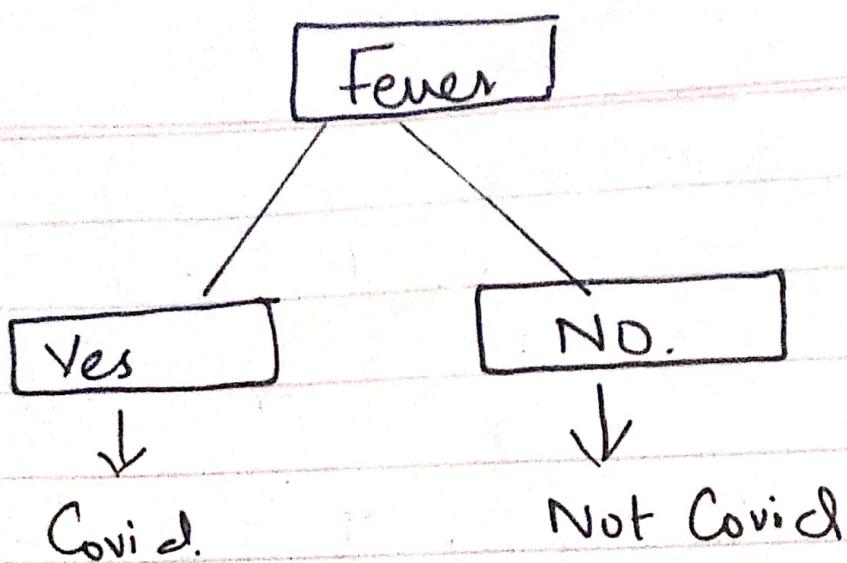
Yes	No
8	2
$[1+, 7-]$	$[2+, 0]$
$e = 0$	
$e = 0.543$	

$$IG(\text{Pain in body}) = 0.881 - \left[\frac{5}{10}(0.721) + \frac{5}{10}(0.97) \right]$$

Yes	No
5	5
$[1+, 4-]$	$[2+, 3]$
$e = 0.721$	$e = 0.97$

$$IG(\text{Pain in body}) = 0.0355$$

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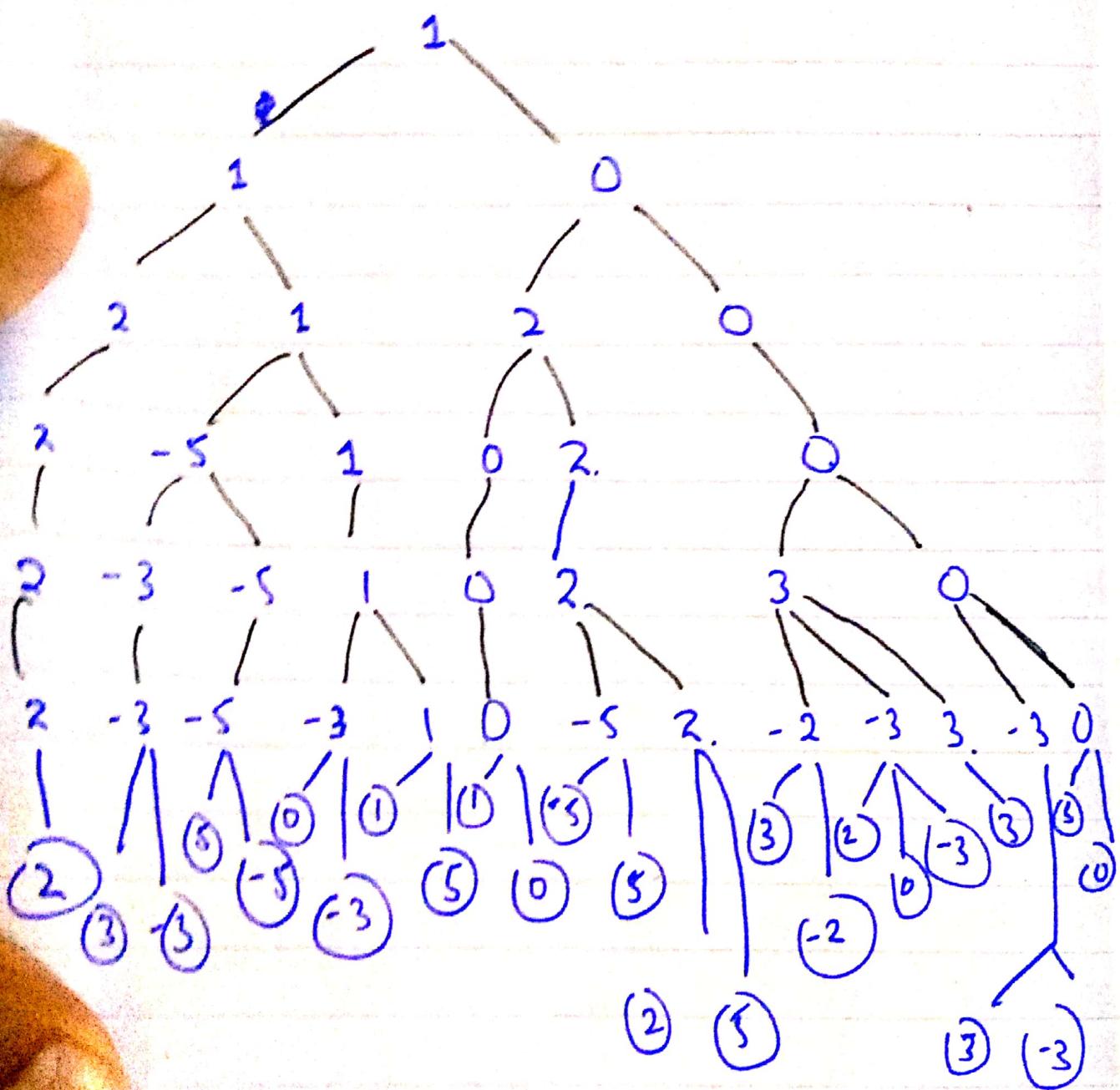
Question 5a:

Yes, BFS used instead of Min-Max.
But search space become very large.

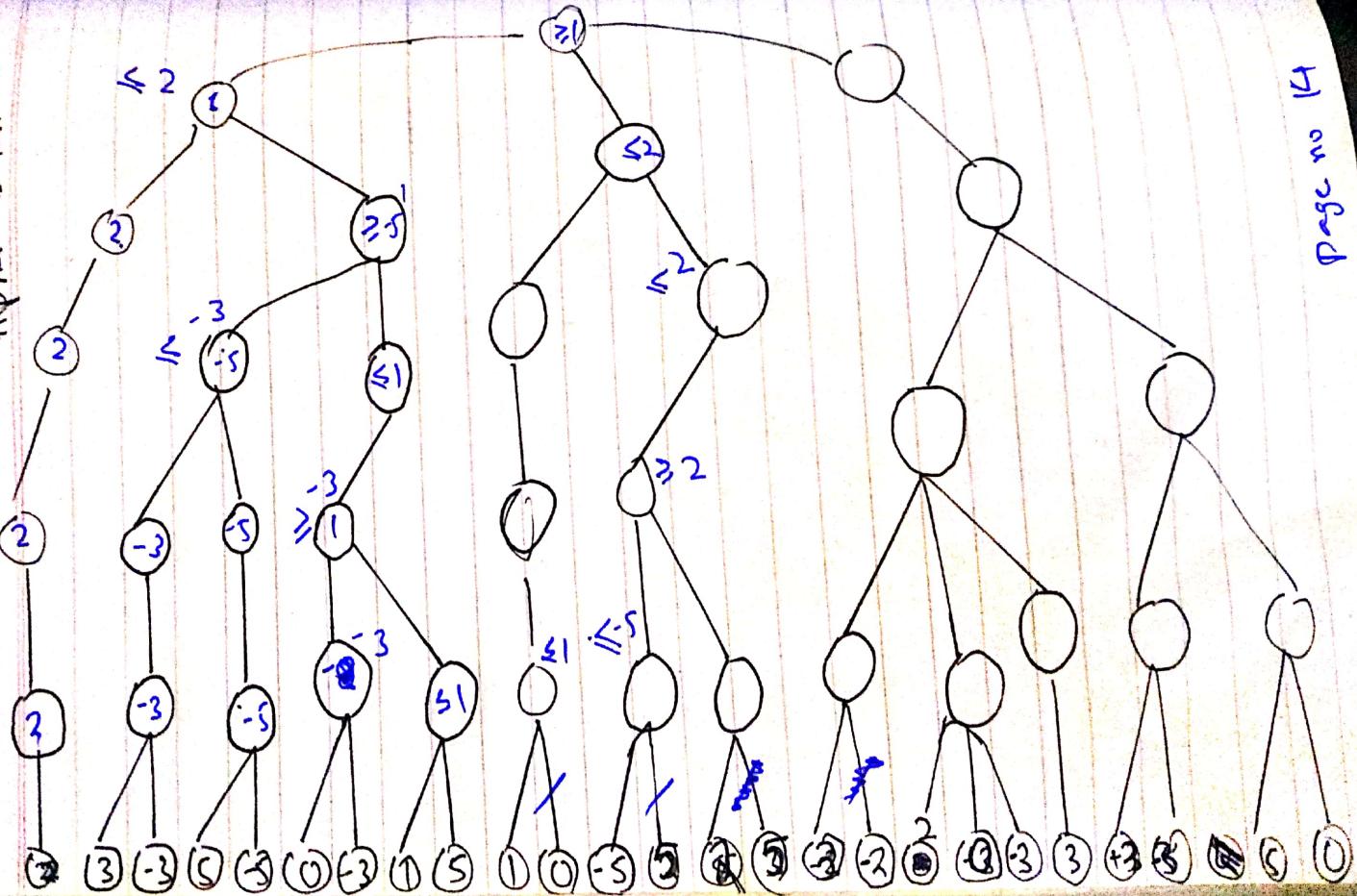
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Min-Max: Game sb.



Question 5b
Alpha - Beta.



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