① DAA Open ended Assignment

classmate

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Q1.

→ For $n = 2^k$, recurrence $A(n) = 7A(n/2) + 18(n/2)^2$ for $n > 1$, $A(1) = 0$ becomes.

$$A(2^k) = 7A(2^{k-1}) + \frac{9}{2}4^k \text{ for } k \geq 1,$$
$$A(1) = 0$$

Solving it by backward substitutions yields the following

$$A(2^k) = 7A(2^{k-1}) + \frac{9}{2}4^k$$

$$= 7[7A(2^{k-2}) + \frac{9}{2}4^{k-1}] + \frac{9}{2}4^k$$

$$= 7^2 A(2^{k-2}) + 7 \cdot \frac{9}{2}4^{k-1} + \frac{9}{2}4^k$$

$$= 7^2[7A(2^{k-3}) + \frac{9}{2}4^{k-2}] + 7 \cdot \frac{9}{2}4^{k-1} + \frac{9}{2}4^k$$

$$= 7^3 A(2^{k-3}) + 7^2 \cdot \frac{9}{2}4^{k-2} + 7 \cdot \frac{9}{2}4^{k-1} + \frac{9}{2}4^k$$

$$= 7^k A(2^{k-k}) + \frac{9}{2}\sum_{i=0}^{k-1} 7^i 4^{k-i}$$

$$= 7^k \cdot 0 + \frac{9}{2}4^k \sum_{i=0}^{k-1}\left(\frac{7}{4}\right)^i$$

$= \frac{9}{2} 4^k \frac{(7/4)^k - 1}{(7/4) - 1} = 6(7^k - 4^k).$

Returning back to the variable $n = 2^k$, we obtain

$$A(n) = 6(7^{\log_2 n} - 4^{\log_2 n}) = 6(n^{\log_2 7} - n^2).$$

Note :- the number of additions in Strassen's algorithm has the same order of growth as the number of multiplication : $\Theta(n^s)$ where $s = n^{\log_2 7} \approx n^{2.807}$)

Q.2.

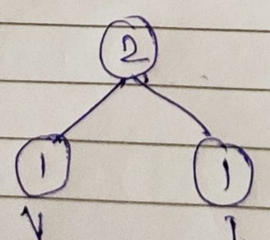
Name :- Vishal Subhash Sule. $\boxed{total : 17}$

Charactor	Frequency	Frequency	char
V	1	4	S
I	1		
S	4		
H	3		
A	2		
L	2		
U	2		
b	1		
E	1		
Space ← -	2		

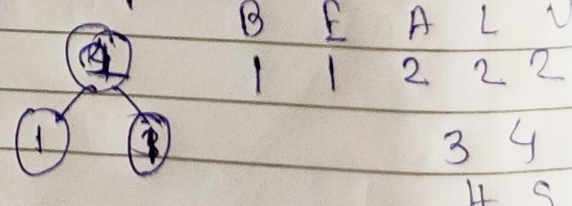
Step 1. :-

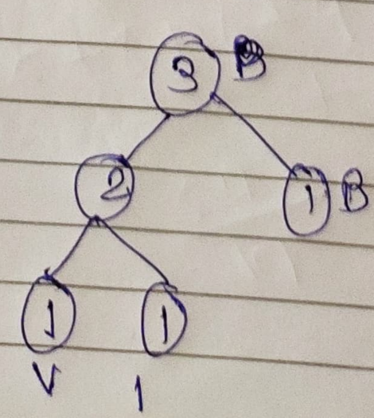
V	I	B	E	A	L	U	H	S
(1)	(1)	(1)	(1)	(2)	(2)	(2)	(3)	(4)

Step 2 :-



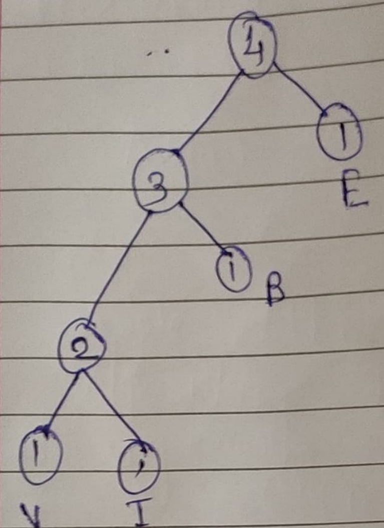
Step:-3





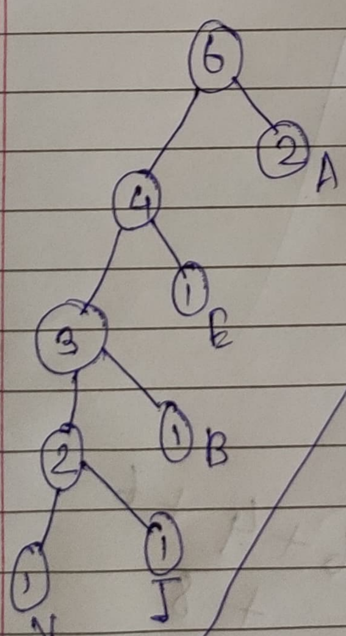
Step- 4

1 2 2 2 3 4
E A L U H S.



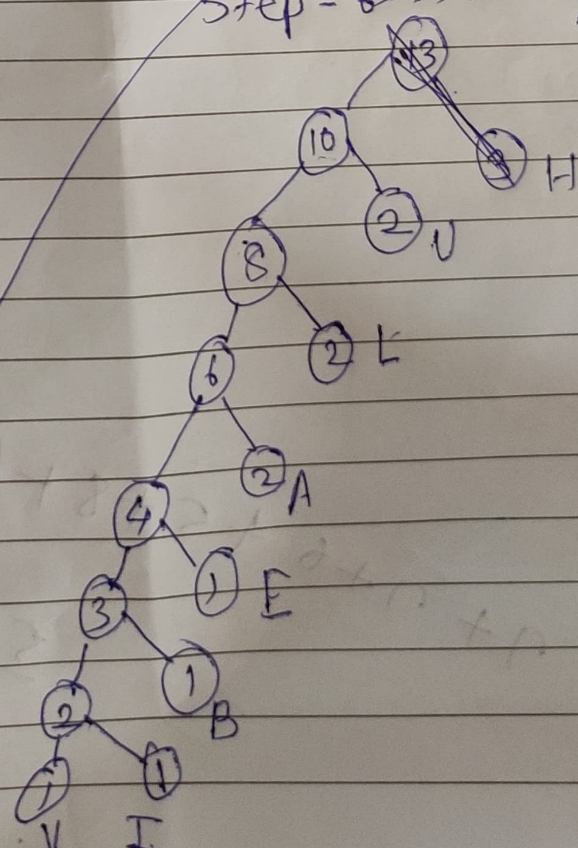
Step- 5

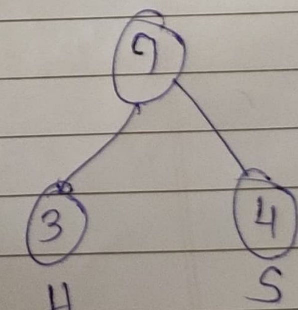
2 2 2 3 4
A L U H S



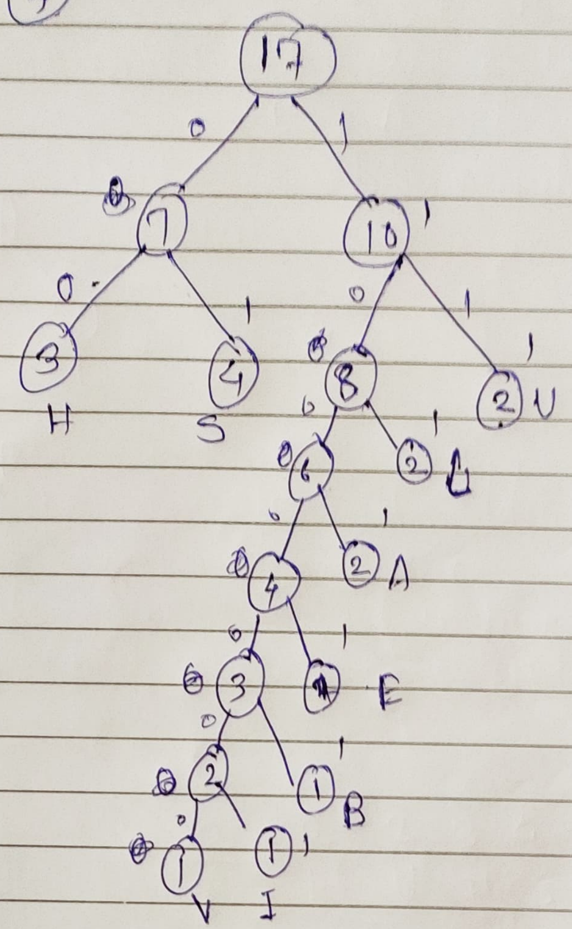
Step - 6 ~~7, 8~~

~~2~~ ~~2~~ ~~3~~ 4
L U H S





Step (7)



Final huffman tree.

Haffman Code

V → 0 0 0 0 0 0 1
J → 1 0 0 0 0 0 1
B → 1 0 0 0 0 1
E → 1 0 0 0 1
A → 1 0 0 1
L → 1 0 1
U → 1 1
H → 0 0
S → 1 0

Left = 0
Right = 1

Average code length character

$$= \frac{\Sigma \text{ Frequency} \times \text{code length}}{\Sigma \text{ frequency}}$$

$$= \frac{(1\times 7)+(1+7)+(1*6)+(1*5)+(2\times 4)+(2*3)+(2\times 2)+(3\times 2)+(4\times 2)}{1+1+1+1+2+2+2+3+4}$$

= 3.35 Ave. length of char

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Q 3. Coins = {1, 2, 3} W = 5

Possible ways = {(1,1,1,1,1), (1,1,1,2},
(1,2,2), (1,1,3) (2,3}.

There are 5 ways.

Efficient algorithm.

~~Opti~~
Efficient algorithm:
Optimal Substructure:

To count the total number, we can divide all set solutions into sets.

W \ Wins	0	1	2	3	4	5
1	1	1	1	1	1	1
2	1	1	2	2	3	3
3	1	1	2	3	4	5

∴ Total 5 ways.