

5) Given: We have the below letters & frequencies

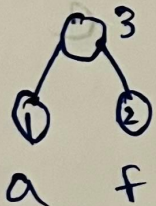
Letters	a	b	c	d	e	f	g	h	i	j
Frequencies	1	7	3	5	9	2	3	10	4	4

Step 1: The initial one is

① ⑦ ③ ⑤ ⑨ ② ③ ⑩ ④ ④  
a b c d e f g h i j

Step 2: We merge the least frequency combination

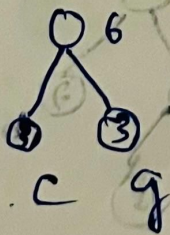
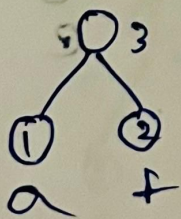
Here, a and f ( $1+2=3$ )



⑦ ③ ⑤ ⑨ ③ ⑩ ④ ④  
b c d e g h i j

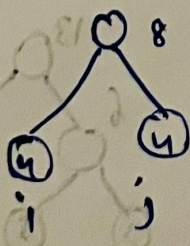
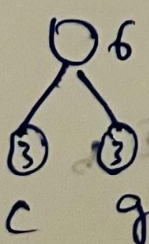
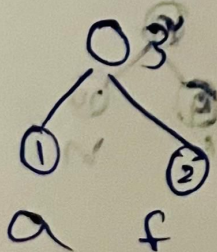
Step 3: We merge the next 2 least frequency combination i.e. c and g ( $3+3=6$ )

So now it's,



⑦ ⑤ ⑨ ⑩ ④ ④  
b d e h i j

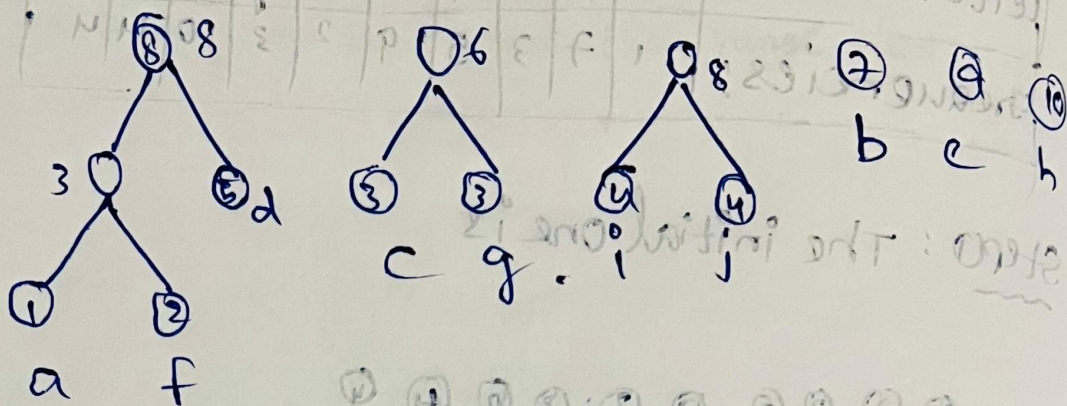
Step 4: Now, we will merge the 4's i.e. ( $4+4=8$ )



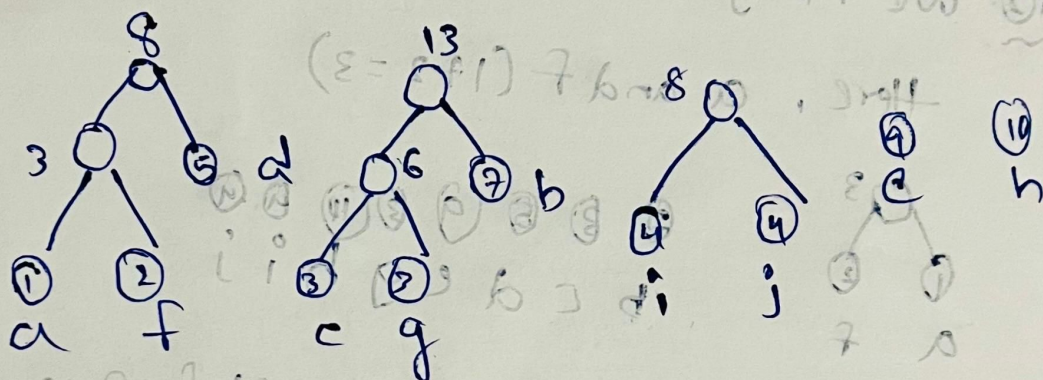
⑦ ⑤ ⑨ ⑩  
b d e h



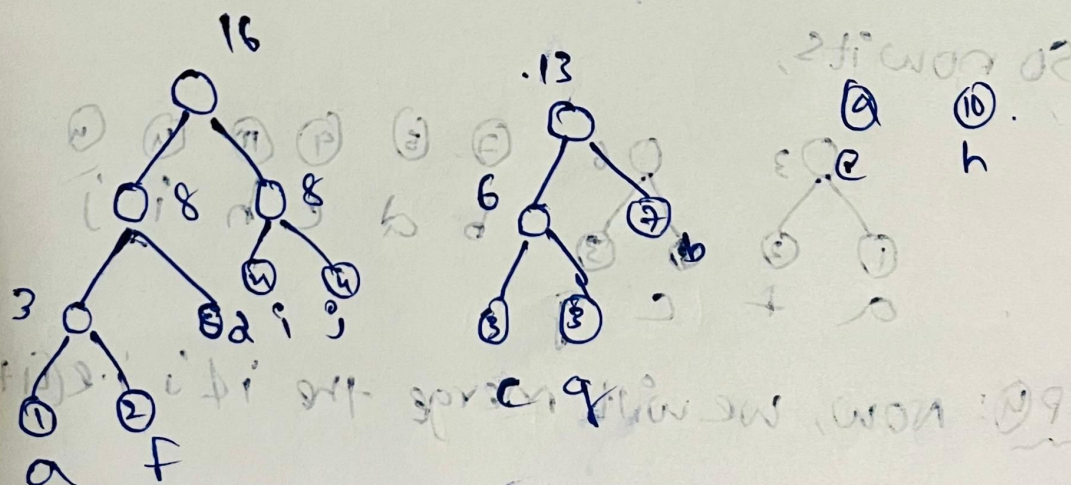
step 5: we should merge (a, f) with d (3+5)



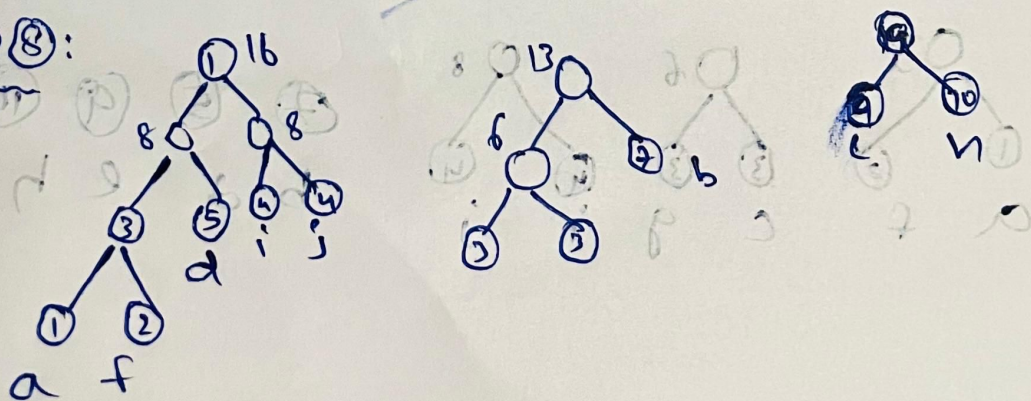
step 6: we merge (c, g) with b.



step 7: now, we should do as below

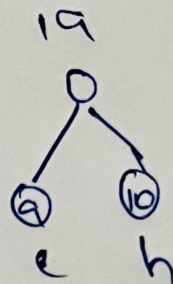
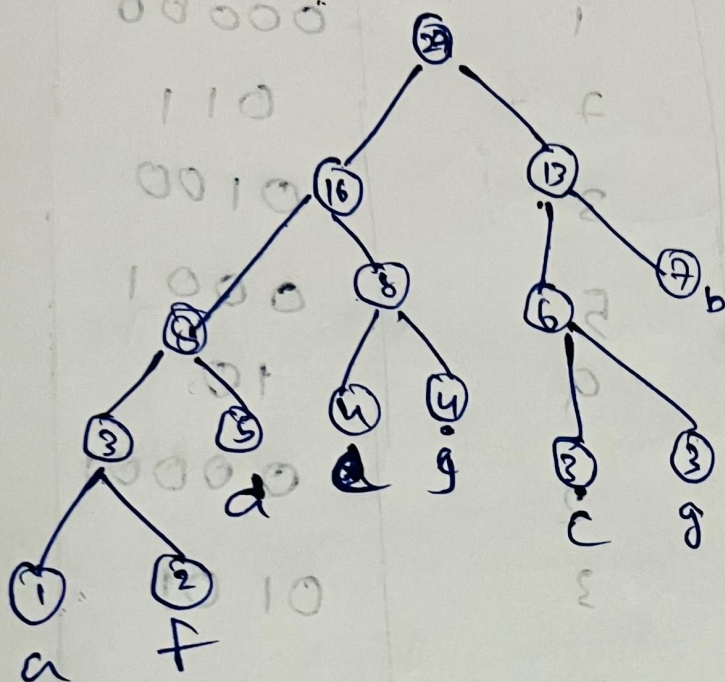


step 8:

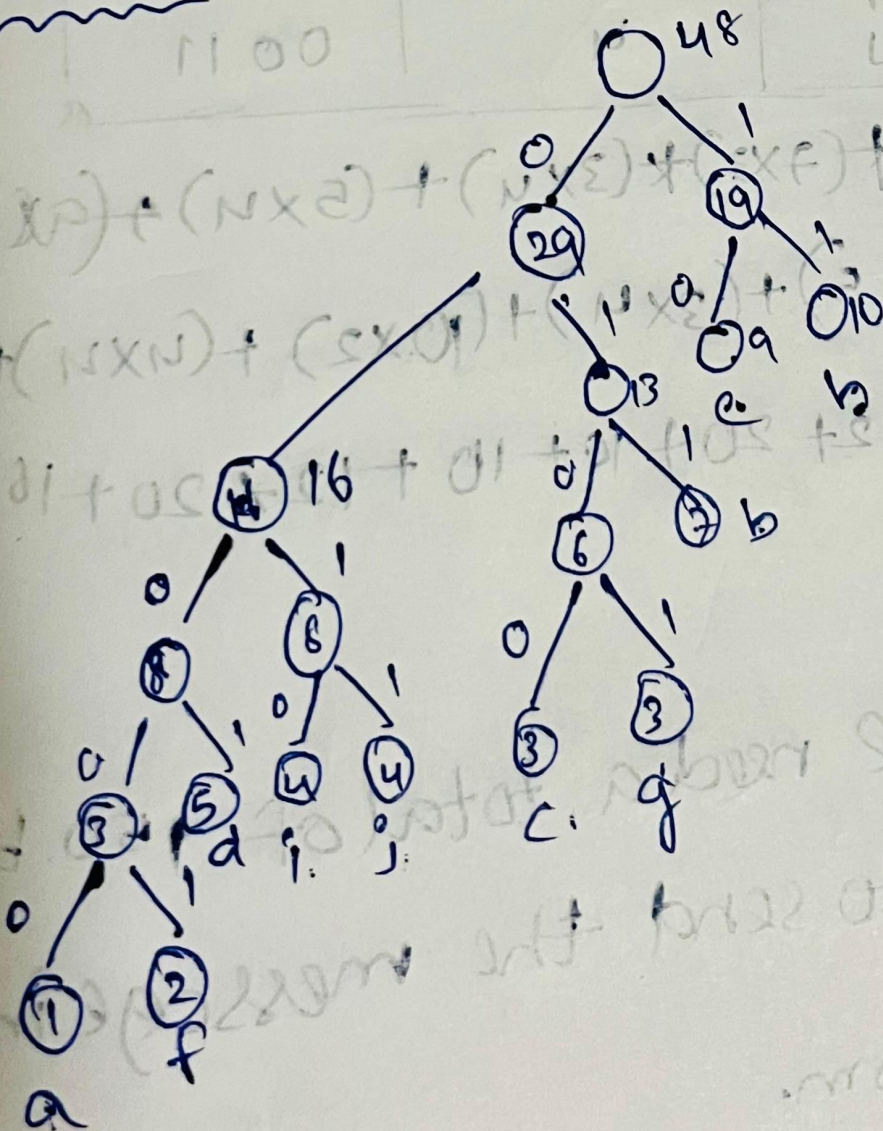




step 9:

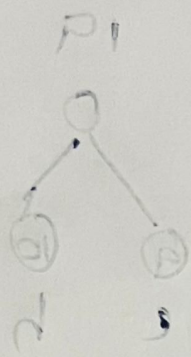


step 10:





Here the ~~flow~~ Table for the frequency



Symbol	frequency	Encoding
a	1	00000
b	7	011
c	3	0100
d	5	0001
e	9	10
f	2	00001
g	3	0101
h	10	11
i	4	0010
j	4	0011

$$\begin{aligned}
 \text{weights} &= (1 \times 5) + (7 \times 3) + (3 \times 4) + (5 \times 4) + (9 \times 2) \\
 &\quad + (2 \times 5) + (3 \times 4) + (10 \times 2) + (4 \times 4) + (4 \times 4) \\
 &= 5 + 21 + 12 + 20 + 18 + 10 + 12 + 20 + 16 + 16 \\
 &= 150.
 \end{aligned}$$

In conclusion, we need a total of 150 bits are required to send the message in an encoded form.