

FREE

India's #1 Learning Platform

Start Complete Exam Preparation

Trusted by 1,86,00,449+ Students

Daily Live
MasterClassesPractice
Question BankMock Tests
& Quizzes

Download App



Question

[View this Question Online >](#)

Consider the string `abbccddeee`. Each letter in the string must be assigned a binary code satisfying the following properties:

1. For any two letters, the code assigned to one letter must not be a prefix of the code assigned to the other letter.
2. For any two letters of the same frequency, the letter which occurs earlier in the dictionary order is assigned a code whose length is at most the length of the code assigned to the other letter.

Among the set of all binary code assignments which satisfy the above two properties, what is the minimum length of the encoded string?

This question was previously asked in
GATE CS 2021 Official Paper: Shift 2

[Attempt Online](#)[View all GATE CS Papers >](#)

1. 23

2. 21

3. 25

4. 30

Answer (Detailed Solution Below)

Option 1 : 23

Detailed Solution

Answer: Option 1

Data:

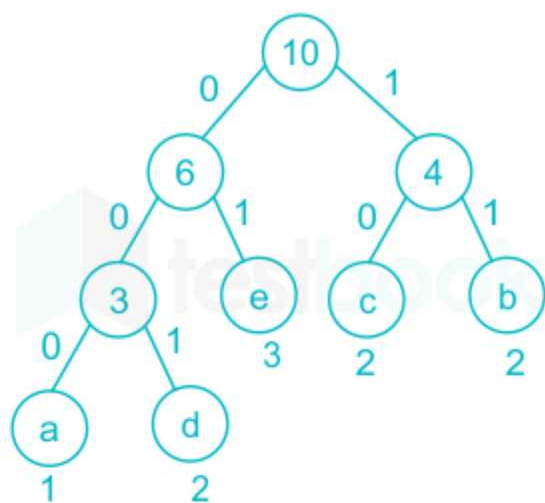
abbccddeee

frequencies are



testbook.com

Letter	Frequency
a	1
b	2
c	2
d	2
e	3



codes :



testbook.com

Letter	code	Frequency
a	000	1
b	11	2
c	10	2
d	001	2
e	01	3

Hence length of the encoded string = $3 \times 1 + 2 \times 2 + 2 \times 2 + 3 \times 2 + 2 \times 3 = \mathbf{23}$

Note:

Those Binary codes satisfy both the condition given in the question.

for example, consider the following codes

a=000

b=001

c=10

d=11

e=01; then this violates the second condition because b alphabetically comes before c; b and c have the same frequency and according to question b should have length at most c and d but here the length of b is greater than c and d.