

Lecture Section:

Monday, Nov 03, 2025

Student Name:

PSU Email ID:

1. (2 pts.) In Huffman encoding, the symbol with the minimum frequency gets the least number of bits.

- (a) True
(b) False

Answer (b)

2. (2 pts.) Using Huffman encoding, how many bits (0 or 1) are needed to store the 20-symbol string represented by the following table of symbols and frequencies?

Symbol	Frequency
A	10
B	4
C	2
D	4

- (a) 18
(b) 34
(c) 36
(d) 38

Answer 18

An example encoding is:

A: 0, B: 10, C: 110, D: 111

Which gives bit count $10 \cdot 1 + 4 \cdot 2 + 2 \cdot 3 + 4 \cdot 3 = 36$

3. (2 pts.) Huffman encoding does which of the following?

- (a) Encodes the input data
(b) Compresses the input data
(c) All of the above

Answer All of the above

Huffman encoding both rewrites the input in a new alphabet (encoding) and reduces the number of bits the input string takes up (compression).

4. (2 pts.) Given the Set Cover instance with items $B = \{1, 2, 3, 4, 5\}$ and sets $S_1 = \{3, 4, 5\}$, $S_2 = \{2, 4, 5\}$, $S_3 = \{1, 5\}$, $S_4 = \{1, 3\}$, what is the optimal (minimum) number of sets needed to cover all the items?

- (a) 1
(b) 2
(c) 3
(d) 4

Answer 2

We can choose S_2 and S_4 to cover all the items.

5. (2 pts.) In the greedy set cover algorithm, what is the greedy choice at each step?

- (a) Selecting largest set by cardinality.
(b) Selecting the set that covers the fewest uncovered elements.
(c) Selecting the set that covers the most uncovered elements per unit cost.
(d) Selecting the smallest set by cardinality.

Answer: (b) Selecting the set that covers the most uncovered elements per unit cost.